Overview

HP Z440 Workstation

1. Integrated Front Handle
2. Dedicated 9.5mm Optical Drive Bay
3. Power Button
4. HDD Activity LED
5. Front I/O: 4 USB 3.0 with Charging Port (topmost port), 1 Microphone, 1 Headset

Overview

6. 2 External 5.25” Bays
7. 2 Internal 3.5” Bays
8. Fan and Front Card Guide Kit (optional)
9. 6 6Gb/s SATA Ports
10. Rear Grip
11. 525W, 85% Efficient Power Supply or 700W, 90% Efficient Power Supply
12. Rear I/O: Rear Power Button, 4 USB 3.0, 2 USB 2.0, PS/2 Ports, 1 RJ-45 to Integrated GbE, 1 Audio Line In, 1 Audio Line Out
13. 8 DIMM Slots for DDR4 ECC Registered Memory
14. Intel Xeon Processors: E5-1600 v3 family (4C/6C/8C), E5-2600 v3 family (8C)
15. 2 PCIe x16 Gen 3 Slots
16. 1 PCIe x8 Gen 3, 1 PCIe x1 Gen 2, 1 PCIe x4 Gen 2, 1 PCI Slot

Overview

Form Factor	Minitower
Operating Systems	Preinstalled: • Microsoft Windows 8.1 Pro 64-bit* • Microsoft Windows 8.1 (China) 64-bit • Microsoft Windows 8.1 Pro 64 downgrade to Windows 7 Professional 64-bit • Microsoft Windows 7 Professional (MSNA) 64-Bit* • HP Installer Kit for Linux (includes drivers for 64-bit OS versions of RHEL 5 & 6 and SUSE Linux Enterprise Desktop 11) • Red Hat® Enterprise Linux Desktop (Paper license with 1 year support; no preinstalled OS) **Notes**: For detailed OS/hardware support information for Linux, see: http://www.hp.com/support/linux_hardware_matrix

Name	Cores	Clock Speed (GHz)	Cache (MB)	Memory Speed (MHz)	Hyper-Threading	Featuring Intel® vPro™ Technology	Intel® Turbo Boost Technology[1]	TDP (W)
Intel® Xeon® E5-1680 v3 processor	8	3.2	20	2133	YES	YES	3, 6	140
Intel Xeon E5-1660 v3 processor	8	3.0	20	2133	YES	YES	3.5	140
Intel Xeon E5-2630 v3 processor	8	2.4	20	1866	YES	YES	2, 8	85
Intel Xeon E5-1650 v3 processor	6	3.5	15	2133	YES	YES	1, 3	140
Intel Xeon E5-1630 v3 processor	4	3.7	10	2133	YES	YES	1, 1	140
Intel Xeon E5-1620 v3 processor	4	3.5	10	2133	YES	YES	1, 1	140
Intel Xeon E5-1607 v3 processor	4	3.1	10	1866	NO	YES	N/A	140
Intel Xeon E5-1603 v3 processor	4	2.8	10	1866	NO	YES	N/A	140

[1]The specifications shown in this column represent the following: (all core maximum turbo steps, one core maximum turbo steps). Turbo boost stepping occurs in 100MHz increments. Processors that do not have turbo functionality are denoted as N/A.

NOTE: Although the Intel Xeon E5-2600 processor family supports dual processors, the HP Z440 Workstation does not support dual processor configurations.

Available Processors	
Disclaimers	Intel's numbering is not a measurement of higher performance. Processor numbers differentiate features within each processor family, not across different processor families. See: http://www.intel.com/products/processor_number/ for details. 64-bit computing on Intel® 64 architecture requires a computer system with a processor, chipset, BIOS, operating system, device drivers and applications enabled for Intel 64 architecture. Processor will not

Overview

	operate (including 32-bit operation) without an Intel 64 architecture-enabled BIOS. Performance will vary depending on your hardware and software configurations. See: http://www.intel.com/info/em64t for more information. Quad-Core, Six-Core, and Eight-Core technologies are designed to improve performance of multithreaded software products and hardware-aware multitasking operating systems and may require appropriate operating system software for full benefits. Check with software provider to determine suitability. Not all customers or software applications will necessarily benefit from use of these technologies.
Color	Jack Black
Convertibility	No
Expansion Slots (see system board section for more details)	**Slot 1** (top): PCI Express Gen2 x1 with open-ended connector* Full-height, Half-length **Slot 2:** PCI Express Gen3 x16 Full-height, Full-length (with extender) **Slot 3:** PCI Express Gen2 x4 with open-ended connector* Full-height, Full-length (with extender) **Slot 4:** PCI Express Gen3 x8 with open-ended connector* Full-height, Full-length (with extender) **Slot 5:** PCI Express Gen3 x16 Full-height, Full-length (with extender) **Slot 6:** PCI 32bit/33MHz Full-height, Full-length (with extender) * Open-ended connector allows a greater bandwidth (e.g. x16) card to be installed physically into a lower bandwidth connector/slot.
Expansion Bays (see storage section for more details)	2 internal 3.5" bays (with acoustic dampening rail assemblies pre-installed) 2 external 5.25" bays • 3rd and 4th 3.5" HDD each occupy one external bay • 3rd and 4th 2.5" HDD/SSD occupy a single external bay within a 2:1 carrier) 1 dedicated 9.5mm slim optical disk drive bay
Front I/O	4 USB 3.0, 1 Headset, 1 Microphone
Internal I/O	1 USB 2.0 ports available by a 2x5 header. Each 2x5 header supports either one HP Internal USB Port Kit (EM165AA) or one 15-in-1 Media Card Reader. 1 USB 3.0 port available by a 2x10 header.
Rear I/O	4 USB 3.0, 2 USB 2.0, 2 PS/2, 1 RJ-45 (NIC), 1 Audio Line-In, 1 Audio Line-Out. Serial supported with optional connector on PCI bracket cabled to system board connector.

Overview

Interfaces Supported	15-in-1 Media Card Reader (optional) 6-channel SATA interface (6 @ 6.0 Gb/s). 6 channels are eSATA configurable for use with eSATA CTO/AMO Kit (No hot plug / hot swap supported). USB 2.0, USB 3.0
On-board RAID Support	RAID 0, 1, 10
Chassis Dimensions (H x W x D)	43.2 x 16.9 x 44.5 cm 17.0 x 6.65 x 17.5 in
Rack Dimensions	4U
Weight	Exact weights depend upon configuration. Minimum: 11.0 kg (24.3 lbs.) Standard: 13.5 kg (29.8 lbs.) Maximum: 17.5 kg (38.5 lbs.)
Temperature	Operating: 5° to 35°C (40° to 95°F) Non-operating: -40° to 60°C (-40° to 140°F)
Humidity	Operating: 8% to 85% relative humidity, non-condensing Non-operating: 8% to 90% relative humidity, non-condensing
Maximum Altitude (non-pressurized)	Operating: 3,048m (10,000ft) Non-operating: 9,144m (30,000ft)
Power Supply	**ENTRY** 525 watts wide-ranging, active Power Factor Correction, 85% Efficient, with no 6-pin graphics power cable The Z440 525W power supply efficiency report can be found at this link: http://www.plugloadsolutions.com/psu_reports/HEWLETT%20PACKARD_753084-001_525W_ECOS%203914_Report.pdf **HIGH-END** 700 watts wide-ranging, active Power Factor Correction, 90% Efficient, with two graphics power cables 700w PSU will support up to 225w of graphics The Z440 700W power supply efficiency report can be found at this link: http://www.plugloadsolutions.com/psu_reports/HEWLETT%20PACKARD_719795-001_700W_ECOS%203915_Report.pdf
Workstation ISV Certifications	See the latest list of certifications at http://www.hp.com/united-states/campaigns/workstations/partnerships.html

Supported Components

Processors

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
Intel Xeon E5-1600 v3 Series CPU				
Intel Xeon E5-1680 v3 3.2 2133 8C CPU	Y	N		
Intel Xeon E5-1660 v3 3.0 2133 8C CPU	Y	N		
Intel Xeon E5-1650 v3 3.5 2133 6C CPU	Y	N		
Intel Xeon E5-1630 v3 3.7 2133 4C CPU	Y	N		
Intel Xeon E5-1620 v3 3.5 2133 4C CPU	Y	N		
Intel Xeon E5-1607 v3 3.1 1866 4C CPU	Y	N		
Intel Xeon E5-1603 v3 2.8 1866 4C CPU	Y	N		
Intel Xeon E5-2600 v3 Series CPU				
Intel Xeon E5-2630 v3 2.4 1866 8C CPU	Y	N		

*Multi-Core is designed to improve performance of certain software products. Not all customers or software applications will necessarily benefit from use of this technology. 64-bit computing system required. Performance will vary depending on your hardware and software configurations. Intel's numbering is not a measurement of higher performance.

Monitors / Displays

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Z Display Z30i 30-inch IPS LED Backlit Monitor				
HP Z Display Z27i 27-inch IPS LED Backlit Monitor				
HP Z Display Z24i 24-inch IPS LED Backlit Monitor				
HP Z Display Z23i 23-inch IPS LED Backlit Monitor				
HP Z Display Z22i 21.5-inch IPS LED Backlit Monitor				
HP DreamColor Z27x Professional Display				
HP DreamColor Z24x Professional Display				

Supported by all operating systems available from HP
Screen size measured diagonally

Storage / Hard Drives

SAS Hard Drives

SAS Hard Drives for HP Workstations	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
600GB SAS 15K rpm 6Gb/s 3.5" HDD	Y	Y	VM647AA	
300GB SAS 15K rpm 6Gb/s 3.5" HDD	Y	Y	LU967AA	
HP 1.2TB SAS 10K SFF HDD	Y	Y	E2P04AA	
HP 600GB SAS 10K SFF HDD	Y	Y	A2Z21AA	
HP 300GB SAS 10K SFF HDD	Y	Y	A2Z20AA	

NOTES:
*For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 30GB of system disk is reserved for system recovery software.

Up to (4) 3.5-inch 15K rpm SAS drives: 300, 600 GB; 2.4 TB max

Supported Components

Up to (4) 2.5-inch 10K rpm SAS drives: 300, 600 GB, 1.2 TB; 4.8 TB max

SAS controller add-in card required

3rd and 4th SFF SAS HDDs will be automatically installed into a single 2:1 5.25" external bay adapter

Removable Boot Drive option

SATA Hard Drives

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
SATA (Serial ATA) Hard Drives for HP Workstations				
500GB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	LQ036AA	
1TB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	LQ037AA	
2.0TB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	QB576AA	
3.0TB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	QF298AA	
500GB SATA 7.2K SED SFF HDD	Y	N		

NOTES:
*For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 30GB of system disk is reserved for system recovery software.

Up to (4) 3.5-inch 7200 rpm SATA drives: 500 GB, 1.0, 2.0, 3.0, 4.0* TB; 16.0 TB max

Up to (1) 2.5-inch SATA Self-Encrypting Drive (SED): 500 GB Opal 1

Removable Boot Drive option

*4TB drive planned to be available late 2014

SATA Solid State Drives

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Solid State Drives (SSDs) for Workstations				
HP 128GB* SATA 6Gb/s SSD	Y	Y	A3D25AA	
HP 256GB* SATA 6Gb/s SSD	Y	Y	A3D26AA	
HP 512GB* SATA 6Gb/s SSD	Y	Y	D8F30AA	
HP 1TB SATA* 6Gb/s SSD	Y	Y	F3C96AA	
HP 256GB SATA* 6Gb/s SED SSD	Y	N		
Intel Pro 1500 180GB SATA SSD	Y	Y	F5Z70AA	
Samsung Enterprise 480GB* SATA SSD	Y	Y	TBD	
Samsung Enterprise 240GB* SATA SSD	Y	Y	F0W94AA	

NOTES:
*For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 30GB of system disk is reserved for system recovery software.

Up to (4) 2.5-inch 6Gb/s SATA Solid State Drives: 128, 256, 512 GB, 1 TB; 4.0 TB max

Up to (1) 2.5-inch 6Gb/s SATA Self-Encrypting Solid State Drive (SED SSD): 256 GB Opal 2

Up to (4) 2.5-inch Intel Pro 1500 6Gb/s SATA Solid State Drive: 180 GB; 720 GB max

Supported Components

Up to (4) 2.5-inch Samsung Enterprise 6Gb/s SATA Solid State Drives: 240, 480 GB; 1.9 TB max

3rd and 4th SSDs will be automatically installed into a single 2:1 5.25" external bay adapter

PCIe Solid State Drives

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
PCIe SSDs for HP Workstations				
HP Z Turbo Drive 512GB SSD	Y	Y	G3G89AA	
HP Z Turbo Drive 256GB SSD	Y	Y	G3G88AA	

NOTES:
*For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 30GB of system disk is reserved for system recovery software.

Up to (2) PCI Express Solid State Drives: 256, 512 GB; 1.0 TB max

PCIe SSDs are not available with SAS controller and/or HDDs

Hard Drive Controllers

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
Integrated SATA 6.0 Gb/s Controller				
Integrated SATA 6.0 Gb/s Controller	Y	N		Six Ports
Factory integrated RAID on motherboard for SATA drives				
RAID 0 Configuration – Striped Array	Y	N		Note 1
RAID 0 Data Configuration -- Boot/OS Drive + 2 Drive Striped Array	Y	N		Note 1
RAID 1 Configuration – Mirrored Array	Y	N		Note 1
RAID 10 Configuration - Striped/Mirrored Array	Y	N		Note 1
LSI 9217-4i4e 8-port SAS 6Gb/s RAID Card				
LSI 9217-4i4e 8-port SAS 6Gb/s RAID Card	Y	Y	E0X20AA	Note 2

SATA hardware RAID is supported on Linux systems that have support for the Intel RSTe technology. The Linux kernel, with built-in software RAID, provides excellent functionality and performance. It is a good alternative to hardware-based RAID. Please visit http://www.hp.com/support/linux_hardware_matrix for RAID capabilities with Linux.
All drives must be identical in type and capacity.
RAID arrays greater than 2 TB are fully supported.

NOTE 1: Requires hard drives with identical speed, capacity, and interface. Specific user-configured hardware SAS RAID configurations are supported on this Linux system. For details, please visit http://www.hp.com/support/linux_hardware_matrix
NOTE 2: Specific user-configured hardware SAS RAID configurations are supported on this Linux system.
IS: Striping of 2 or more HDDs into a single logical volume
IM: Mirroring of 2 HDDs into a single logical volume
IME: Mirroring of 3 or more HDDs into a single logical volume.
For details, please visit http://www.hp.com/support/linux_hardware_matrix

Supported Components

Graphics

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes	Supported # of cards	Supported Mixed?
Professional 2D						
NVIDIA NVS 310 512MB Graphics	Y	Y	A7U59AA	Note 1	3	
NVIDIA NVS 315 1GB Graphics	Y	Y	E1U66AA	Note 1	3	
NVIDIA NVS 510 2GB Graphics	Y	Y	C2J98AA	Note 2	2	
Graphics Cable Adapters HP DisplayPort to Dual Link DVI Adapter	Y	Y	NR078AA		1	
HP DisplayPort To DVI-D Adapter	Y	Y	FH973AA		1	
HP DisplayPort To DVI-D Adapter (2-Pack)	Y	N			1	
HP DisplayPort To DVI-D Adapter (4-Pack)	Y	N			1	
HP DisplayPort To DVI-D Adapter (6-Pack)	Y	N			1	
HP DisplayPort To VGA Adapter	Y	Y	AS615AA		1	
HP DisplayPort To VGA Adapter 2nd	Y	N			1	
Entry 3D						
NVIDIA Quadro K620 2GB Graphics	Y	Y	J3G87AA		2	
NVIDIA Quadro K420 1GB Graphics	Y	Y	J3G86AA		2	
Mid-range 3D						
NVIDIA Quadro K2200 4GB Graphics	Y	Y	J3G88AA	Note 5	2	
AMD FirePro W2100 2GB Graphics	Y	Y	J3G91AA		2	
AMD FirePro W5100 4GB Graphics	Y	Y	J3G92AA	Note 5	1	
High End 3D						
NVIDIA Quadro K4200 4GB Graphics	Y	Y	J3G89AA	Notes 3, 4	1	
NVIDIA Quadro K5200 8GB Graphics	Y	Y	J3G90AA	Notes 3, 4	1	
NVIDIA Quadro K6000 12GB Graphics	Y	Y	C2J96AA	Notes 3, 4	1	

Note 1: When configuring with a 3rd NVS 310 or 315--the configuration requires the HP Z4 Fan and Front Card Guide Kit, which is available both CTO (G8T99AV) and AMO (J9P80AA).
Note 2: If 1st graphics card is NVS 510 then 2nd graphics card must be NVS 510 or NVS 310.
Note 3: Configuration requires the HP Z4 Fan and Front Card Guide Kit, which is available both CTO (G8T99AV) and AMO (J9P80AA).
Note 4: Supported on 700W PSU chassis only.
Note 5: Dual graphics configuration supported on 700W PSU chassis only.

High Performance GPU Computing	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
NVIDIA Tesla K40 Workstation Coprocessor	Y	Y	F4A88AA	Notes 1, 2, 3

NOTE 1: This device does not have an operational graphics output.
Tesla K40 configurations require the addition of either NVIDIA Quadro K620 1st graphics or NVIDIA Quadro K2200 1st graphics. Configurations available early 2015.

Supported Components

NOTE 2: All Tesla configurations require the HP Z4 Fan and Front Card Guide Kit, which is available both CTO (G8T99AV) and AMO (J9P80AA).

NOTE 3: Supported on 700W PSU chassis only.

Memory

CTO	Option Kit Part Number	Support Notes
DDR4-2133 ECC Registered DIMMs		
16GB DDR4-2133 ECC Registered RAM	J9P83AA	1,2
8GB DDR4-2133 ECC Registered RAM	J9P82AA	1,2
4GB DDR4-2133 ECC Registered RAM	J9P81AA	1,2
Memory Cooling Solution		
HP Z440 Memory Cooling Solution	J2R52AA	3

NOTES:
For details on the supported memory configurations on the HP Z440 Workstation, please refer to the System Technical Specifications - System Board section of this document.

Each processor supports up to 4 channels of DDR4 memory. To realize full performance at least 1 DIMM must be inserted into each channel.

The CPUs determine the speed at which the memory is clocked. If an 1866MHz capable CPU is used in the system, the maximum speed the memory will run at is 1866MHz, regardless of the specified speed of the memory.

NOTE 1: ONLY registered DDR4 DIMMs are supported.
DDR3 DIMMs ARE NOT SUPPORTED.
NOTE 2: Configurations of greater than 4x memory DIMMs require the HP Z440 Memory Cooling Solution, which is available both CTO (J2R51AV) and AMO (J2R52AA).
The HP Z440 Memory Cooling Solution is available to add to any configuration for improved system cooling, but is required for proper memory cooling on any Z440 configuration with greater than 4 memory DIMMs installed. It can only be installed on the HP Z440 Workstation.
NOTE 3: If a user installs greater than 4 memory DIMMs in a Z440 system without also installing the HP Z440 Memory Cooling Solution, they will be presented with an F1 boot stop requiring a manual override each time the system is rebooted.

Multimedia and Audio Devices

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
Integrated Realtek HD ALC221 Audio	Y	N		

Optical and Removable Storage

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP SlimTray Optical Drives				
HP 9.5mm Slim SuperMulti DVD Writer	Y	Y	K3R64AA	

Supported Components

HP 9.5mm Slim DVD-ROM Drive	Y	Y	K3R63AA	Note 1
HP 9.5mm Slim BDXL Blu-Ray Writer	Y	Y	K3R65AA	Note 2
HP 15-in-1 Media Card Reader				
HP 15-in-1 Media Card Reader	Y	Y	G1S79AA	
HP DX115 Removable Drive Enclosure				
HP DX115 Removable HDD Carrier	N	Y	NB792AA	

Actual speeds may vary. Does not permit copying of commercially available DVD movies or other copyright protected materials. Intended for creation and storage of your original material and other lawful uses. Double Layer discs can store more data than single layer discs. However, double-layer discs burned with this drive may not be compatible with many existing single-layer DVD drives and players.

With Blu-ray, certain disc, digital connection, compatibility and/or performance issues may arise, and do not constitute defects in the product. Flawless playback on all systems is not guaranteed. In order for some Blu-ray titles to play, they may require a DVI or HDMI digital connection and your display may require HDCP support. HD-DVD movies cannot be played on this workstation.

NOTE 1: Not supported as a 2nd drive option.
NOTE 2: Cannot be ordered in combination with another Blu-ray Writer.

Controller Cards

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP IEEE 1394b FireWire® PCIe Card	Y	Y	NK653AA	
HP Thunderbolt™ 2 PCIe 1-port I/O Card	Y	Y	F3F43AA	Note 1

NOTE 1: Compatible with NVIDIA Quadro K620, K2200, K4200, and K5200 only.

Networking and Communications

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
Integrated Intel I218LM PCIe GbE Controller	Y	N		
Intel Ethernet I210-T1 PCIe NIC	Y	Y	E0X95AA	
HP X520 10GbE Dual Port Adapter	Y	Y	C3N52AA	
HP 10GbE SFP+ SR Transceiver	Y	Y	C3N53AA	
HP 361T PCIe Dual Port Gigabit NIC	N	Y	C3N37AA	Note 1
Intel 7260 802.11 a/b/g/n PCIe WLAN NIC	N	Y	F2P07AA	

NOTE 1: "Gigabit" Ethernet indicates compliance with IEEE standard 802.3ab for Gigabit Ethernet, and does not connote actual operating speed of 1 Gb/sec. For high speed transmission, connection to a Gigabit Ethernet server and network infrastructure is required.

*Wireless access point and internet service required. Availability of public wireless access points limited.

Racking and Physical Security

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes

Supported Components

HP Solenoid Hood Lock & Hood Sensor	Y	Y	DE618A
HP Business PC Security Lock Kit	N	Y	PV606AA
HP xw4/Z2/Z4 Depth Adjustable Fixed Rail Rack Kit	N	Y	WH340AA

Input Devices

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP PS/2 Keyboard	Y	Y	QY774AA	
HP USB Keyboard	Y	Y	QY776AA	
HP USB Smart Card Keyboard	Y	Y	E6D77AA	
HP Wireless Keyboard and Mouse	Y	Y	QY449AA	
HP PS/2 Mouse	Y	Y	QY775AA	
HP USB Optical Mouse	Y	Y	QY777AA	
HP USB 1000dpi Laser Mouse	Y	Y	QY778AA	
HP USB Optical 3-Button 2.9M OEM Mouse	N	Y	ET424AA	
HP SpaceMouse Pro USB 3D Input Device	N	Y	B4A20AA	
HP SpacePilot Pro 3D USB Intelligent Controller	N	Y	WH343AA	

Other Hardware

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Z440 Memory Cooling Solution	Y	Y	J2R52AA	Note 1
HP Z440 Fan and Front Card Guide Kit	Y	Y	J9P80AA	Note 2
HP Internal USB Port Kit	N	Y	EM165AA	Note 3
HP eSATA PCI Cable Kit	Y	Y	GM110AA	Note 4
HP Serial Port Adapter	Y	Y	PA716A	
HP Optical Bay HDD Mounting Bracket	N	Y	NQ099AA	
HP Power Cord Kit	N	Y	DM293A	
HP Workstation Mouse Pad	Y	N		Japan only
HP ENERGY STAR® Enabled Configuration	Y	N		

Note 1: The HP Z440 Memory Cooling Solution is available to add to any configuration for improved system cooling, but is required for memory configurations using greater than 4x DIMMs.

Note 2: Required for the following graphics configurations:
- 3 x NVIDIA NVS 310/315
- 1 x NVIDIA Quadro K4200
- 1 x NVIDIA Quadro K5200
- 1 x NVIDIA Quadro K6000

Note 3: The HP Internal USB Port kit has a single USB 2.0 type A connector.

Note 4: No hot plug / hot swap supported

Software

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Performance Advisor	Y	Y		Note 1
HP Remote Graphics Software (RGS) 6.0	Y	Y		Note 2

Supported Components

MS Office Home & Business 2013	Y	N	Note 3
Cyberlink PowerDVD and Power2Go	Y	N	
Foxit PhantomPDF Express	Y	N	

NOTE 1: Available as a free download here: www.hp.com/go/performanceadvisor
NOTE 2: Supported operating systems:
- Windows 7 Professional 32/64
- Windows 8 Professional 32/64
- RHEL v6.5
- SLED 11 SP3

For more information, go to: www.hp.com/go/rqs
NOTE 3: Must select as a Configure to Order option.

Operating Systems

	Support Notes
Windows 8.1 Pro 64-bit*	
Windows 7 Professional 64-bit (available through downgrade rights from Windows 8.1 64-bit)**	
Windows 7 Professional (MSNA) 64-Bit*	(National Academic)
HP Linux Installer Kit	
Red Hat Enterprise Linux (RHEL) Workstation - Paper License (1yr)	Note 1

* Not all features are available in all editions or versions of Windows. Systems may require upgraded and/or separately purchased hardware, drivers and/or software to take full advantage of Windows functionality. See http://www.microsoft.com.

** This system is preinstalled with Windows® 7 Pro software and also comes with a license and media for Windows 8.1 Pro software. You may only use one version of the Windows software at a time. Switching between versions will require you to uninstall one version and install the other version. You must back up all data (files, photos, etc.) before uninstalling and installing operating systems to avoid loss of your data.

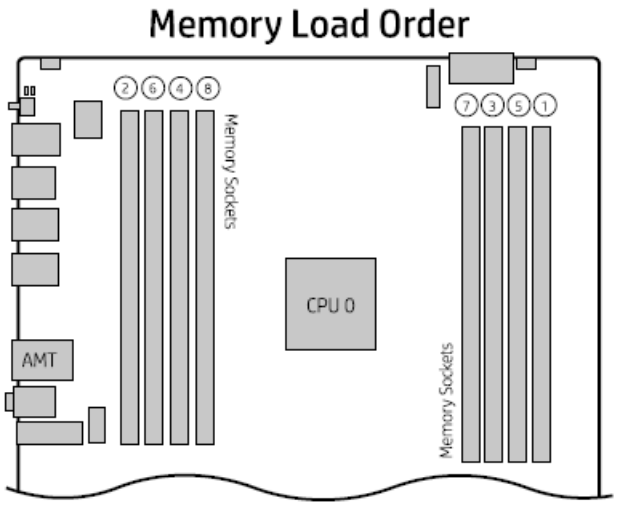
NOTE 1: This second OS must be ordered with the HP Linux Installer Kit as the first OS.

System Board	
System Board Form Factor	Main System Board: 24 x 31 cm 9.6 x 12.2 inches
Processor Socket	Single LGA2011 R3
Chipset	Intel® C612 Chipset
Super I/O Controller	Nuvoton NPCD379H (SIO-12)
Memory Expansion Slots	8 DDR4 memory slots
Memory Type Supported	DDR4, RDIMM (Registered), ECC: 4GB, 8GB and 16GB
Memory Modes	Channel Interleaved
Memory Speed Supported	1600MHz, 1866MHz and 2133MHz
Memory Protection	ECC available on data, parity on address and command
Memory	
Memory Configuration Table	Please refer to the table below for details on how supported memory configurations are installed in your system. * For 32 bit operating systems, there is a memory limit of 4GB. ~ Although technically possible, these configurations are not available to order at this time.

CPU 0										
Front Slots						Rear Slots				
	Notes	**DIMM1**	**DIMM2**	**DIMM3**	**DIMM4**	**DIMM5**	**DIMM6**	**DIMM7**	**DIMM8**	**Rating**
4GB	*	4GB								Fair
8GB		4GB 8GB							4GB	Good Fair
12GB		4GB		4GB					4GB	Better
16GB		4GB 8GB		4GB			4GB		4GB 8GB	Best Good
32GB		4GB 8GB 16GB	4GB	4GB 8GB	4GB	4GB	4GB 8GB	4GB	4GB 8GB 16GB	Best Best Good
48GB	~	8GB	4GB	8GB	4GB	4GB	8GB	4GB	8GB	Best
64GB		8GB 16GB	8GB	8GB 16GB	8GB	8GB	8GB 16GB	8GB	8GB 16GB	Best Best
96GB	~	16GB	8GB	16GB	8GB	8GB	16GB	8GB	16GB	Best
128GB		16GB	16GB	16GB	16GB	16GB	16GB	16GB	16GB	Best

For a detailed diagram, please refer to the label located on the inside of the system side panel.

System Technical Specifications



Maximum Memory	Supports up to 128GB
Memory Configuration (Supported)	Only ECC DIMMs are supported.
Note on Maximum Memory	Maximum memory capacities assume 64-bit operating systems such as Windows 8.1 64-bit, Windows 7 Ultimate 64-bit, or Windows 7 Professional 64-bit. Windows 7 Professional 32-bit supports up to 4GB. Linux 32-bit supports up to 8GB.
PCI Express Connectors	Slot 1 (top): PCI Express Gen2 x1 Full-height, Half-length Slot 2: PCI Express Gen3 x16 Full-height, Full-length (with extender) Slot 3: PCI Express Gen2 x4 with open-ended connector** Full-height, Full-length (with extender) Slot 4: PCI Express Gen3 x8 with open-ended connector** Full-height, Full-length (with extender) Slot 5: PCI Express Gen3 x16 Full-height, Full-length (with extender) ** Open-ended connector allows a greater bandwidth (e.g. x16) card to be installed physically into a lower bandwidth connector/slot.
PCI Connectors (5.0V)	Slot 6: PCI 32bit/33MHz Full-height, Full-length (with extender)

System Technical Specifications

Supported Drive Interfaces	**SATA**	2 SATA @6Gb/s, supports RAID 0,1 and NCQ. 4 sSATA @6Gb/s, Supports RAID 0,1,10 and NCQ. Factory integrated RAID is Microsoft Windows only.
	Serial Attached SCSI	Requires Optional PCIe card
	Integrated RAID	SATA: RAID 0, 1 SSATA: RAID 0, 1, 10 • RAID 0 configuration - striped array (supported and configure to order) • RAID 1 configuration - mirrored array (supported and configure to order) • RAID 5 parity striping (supported but not configure to order) • RAID 10 striped and mirrored array *HW RAID functionality not supported by Linux. Use SW RAID functionality provided in the Red Hat Operating system instead.
	Integrated Graphics	No
	Network Controller	Integrated Intel I-218 Gbit LAN Supports the following management functionalities: Intel AMT9.1, TXT, DASH 1.1, WOL, VLAN, Teaming and PXE 2.1
	External SATA (eSATA)	Supported on all SATA and sSATA ports configurable with optional eSATA* cable kit * hot plug / hot swap not supported with eSATA
	IDE connector	No
	Floppy connector	No
	Serial	1 internal header
	2nd Serial	No
	Parallel	No
	AUX IN (audio)	No
IEEE 1394 Connector(s)	**Front**	None
	Rear	2 IEEE 1394b (requires optional PCIe card)
	Internal	None
USB Connector(s)	**Front**	4 USB 3.0
	Rear	4 USB 3.0 2 USB 2.0
	Internal	1 USB 2.0 port available by a 2x5 header. Each 2x5 header supports either one HP Internal USB Port Kit (EM165AA) or one 15-in-1 Media Card Reader.

System Technical Specifications

		1 USB 3.0 port available by a 2x10 header.		
HD Integrated Audio	Realtek ALC221			
Flash ROM	Yes			
CPU Fan Header	Yes			
Chassis Fan Header	1 Rear System Chassis Fan Header			
Front PCI Fan Header	Yes			
Front Control Panel/Speaker Header	Yes			
CMOS Battery Holder - Lithium	Yes			
Integrated Trusted Platform Module	Infineon TPM 1.2 Certified			
Power Supply Headers	Yes			
Power Switch, Power LED & Hard Drive LED Header	Yes			
Clear Password Jumper	Yes			
Serial Port	1 internal header			
Parallel Port	No			
Keyboard/Mouse	USB or PS/2			
Power Supply				
Power Supply	700W 90% Efficient, Custom PSU (Wide-Ranging, Active PFC)		525W 85% Efficient, Custom PSU (Wide-Ranging, Active PFC)	
Operating Voltage Range	90–269 VAC		90–269 VAC	
Rated Voltage Range	100-240 VAC	118 VAC	100-240 VAC	118 VAC
Rated Line Frequency	50–60 Hz	400 Hz	50–60 Hz	400 Hz
Operating Line Frequency Range	47–66 Hz	393–407 Hz	47–66 Hz	393–407 Hz
Rated Input Current	100-240V @ 9.5A	118V @ 9.5A	100-240V @ 7A	118V @ 7A
Heat Dissipation (Configuration and software dependent)	Typical = 1648 btu/hr (415 kg-cal/hr) Max = 2746 btu/hr (692 kg-cal/hr)		Typical = 1311 btu/hr (330 kg-cal/hr) Max = 2185 btu/hr (551 kg-cal/hr)	
Power Supply Fan	92x25 mm variable speed		92x25 mm variable speed	
ENERGY STAR Qualified (Configuration dependent)	Yes		Yes	
80 PLUS® Compliant	Yes, 90% Efficient The Z440 700W power supply efficiency report can be found at this link: http://www.plugloadsolutions.com/psu_reports/HEWLETT%20PACKARD_719795-001_700W_ECOS%203915_Report.pdf		Yes, 85% Efficient The Z440 525W power supply efficiency report can be found at this link: http://www.plugloadsolutions.com/psu_reports/HEWLETT%20PACKARD_753084-001_525W_ECOS%203914_Report.pdf	
FEMP Standby Power Compliant @115V (<2W in S5 – Power Off)	Yes		Yes	
EuP Compliant @ 230V	Yes		Yes	

System Technical Specifications

(<0.5 W in S5 – Power Off)		
CECP Compliant @ 220V (<4W in S3 – Suspend to RAM)	Yes; Configuration dependent	Yes; Configuration dependent
Power Consumption in sleep mode (as defined by ENERGY STAR) – Suspend to RAM (S3) (Instantly Available PC)	<15w	<15w
Built-in Self Test LED	Yes	Yes
Surge Tolerant Full Ranging Power Supply (withstands power surges up to 2000V)	Yes	Yes
Hood Lock Header	Yes	
Hood Sensor Header	Yes	
Memory Fan	1 Memory Fan Header	

SYSTEM CONFIGURATION

Example Configuration #1 ENERGY STAR QUALIFIED	Processor	1x Intel Xeon E5-1603 v3 (Quad-Core)					
	Memory	1x 4GB DDR4–2133 Registered RAM					
	Graphics	1x NVIDIA NVS 310					
	Disks / Optical	1x 500GB SATA 7200 / 1x Slim DVD-ROM SATA					
	Power Supply	525W 85% Custom PSU					
	Other	N/A					
Energy Consumption		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	51.01 W		51.29 W		53.01 W	
	Windows Busy Typ(S0)	112.95 W		110.62 W		113.96 W	
	Windows Busy Max (S0)	117.16 W		112.45 W		114.67 W	
	Sleep (S3)	2.34 W	2.19 W	2.54 W	2.41 W	2.33 W	2.19W
	Off (S5)	0.825 W	0.784 W	1.024 W	0.985 W	0.851 W	0.772 W
	Zero Power Mode (ErP)	0.190 W		0.382 W		0.178 W	
Heat Dissipation (Btu/hr)		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Enabled	LAN Disabled	LAN Enabled
	Windows Idle (S0)	174.06 Btu/hr		175.02 Btu/hr		180.89 Btu/hr	
	Windows Busy Typ(S0)	385.39 Btu/hr		377.4 Btu/hr		388.83 Btu/hr	
	Windows Busy Max (S0)	399.75 Btu/hr		383.68 Btu/hr		391.25 Btu/hr	
	Sleep (S3)	7.98 Btu/hr	7.49 Btu/hr	8.68 Btu/hr	8.21 Btu/hr	7.95 Btu/hr	7.47 Btu/hr
	Off (S5)	2.18 Btu/hr	2.67 Btu/hr	3.49 Btu/hr	3.36 Btu/hr	2.90 Btu/hr	2.63 Btu/hr
	Zero Power Mode (ErP)	0.649 Btu/hr		1.303 Btu/hr		0.607 Btu/hr	

Example Configuration #2 ENERGY STAR QUALIFIED	Processor	1x Intel Xeon E5-1630 v3 (Quad-Core)					
	Memory	2x 4GB DDR4–2133 Registered RAM					
	Graphics	1x NVIDIA Quadro K620					
	Disks / Optical	1x 500GB SATA 7200 / 1xSlim DVD-ROM SATA					
	Power Supply	700W 90% Custom PSU					
	Other	N/A					
Energy Consumption (Watts)		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	62.25 W		61.50 W		62.31 W	
	Windows Busy Typ(S0)	112.48 W		111.39 W		113.48 W	
	Windows Busy Max (S0)	136.87 W		129.05 W		113.64 W	
	Sleep (S3)	2.25 W	2.147 W	2.41 W	2.30 W	2.25 W	2.14 W
	Off (S5)	0.821 W	0.775 W	1.024 W	0.925 W	0.842 W	0.769 W
	Zero Power Mode (ErP)	0.167 W		0.306 W		0.158 W	
Heat Dissipation		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Enabled	LAN Disabled	LAN Enabled

System Technical Specifications

(Btu/hr)	Windows Idle (S0)	212.43 Btu/hr		209.85 Btu/hr		212.62 Btu/hr	
	Windows Busy Typ(S0)	383.78 Btu/hr		380.06 Btu/hr		387.19 Btu/hr	
	Windows Busy Max (S0)	467.00 Btu/hr		440.32 Btu/hr		387.74 Btu/hr	
	Sleep (S3)	7.69 Btu/hr	7.31 Btu/hr	8.21 Btu/hr	7.85 Btu/hr	7.67 Btu/hr	7.31 Btu/hr
	Off (S5)	2.80 Btu/hr	2.65 Btu/hr	3.49 Btu/hr	3.16 Btu/hr	2.87 Btu/hr	2.62 Btu/hr
	Zero Power Mode (ErP)	0.568 Btu/hr		1.043 Btu/hr		0.538 Btu/hr	

Example Configuration #3	Processor	1x Intel Xeon E5-1620 v3 (Quad-Core)					
	Memory	2x 8GB DDR4–2133 Registered RAM					
	Graphics	1x NVIDIA Quadro K2200					
	Disks/Optical	2x 1TB SATA 7200 / 1x Slim SuperMulti DVDRW SATA					
	Power Supply	525W 85% Custom PSU					
	Other	N/A					
Energy Consumption (Watts)		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	51.41 W		51.15 W		52.42 W	
	Windows Busy Typ(S0)	179.17 W		175.74 W		176.74 W	
	Windows Busy Max (S0)	201.86 W		198.12 W		196.99 W	
	Sleep (S3)	2.35 W	2.28 W	2.55 W	2.49 W	2.38 W	2.27 W
	Off (S5)	0.827 W	0.785 W	1.028 W	0.986 W	0.853 W	0.770 W
	Zero Power Mode (ErP)	0.167 W		0.382 W		0.177 W	
Heat Dissipation (Btu/hr)		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Enabled	LAN Disabled	LAN Enabled
	Windows Idle (S0)	178.82 Btu/hr		174.56 Btu/hr		178.88 Btu/hr	
	Windows Busy Typ(S0)	611.33 Btu/hr		599.62 Btu/hr		603.04 Btu/hr	
	Windows Busy Max (S0)	688.75 Btu/hr		675.99 Btu/hr		672.13 Btu/hr	
	Sleep (S3)	8.02 Btu/hr	7.79 Btu/hr	8.71 Btu/hr	8.48 Btu/hr	8.13 Btu/hr	7.76 Btu/hr
	Off (S5)	2.82 Btu/hr	2.67 Btu/hr	3.51 Btu/hr	3.36 Btu/hr	2.91 Btu/hr	2.62 Btu/hr
	Zero Power Mode (ErP)	0.571 Btu/hr		1.305 Btu/hr		0.604 Btu/hr	

Example Configuration #4	Processor	1x Intel Xeon E5-1680 v3 (Eight-Core)					
	Memory	4x 16GB DDR4–2133 Registered RAM					
	Graphics	1x NVIDIA Quadro K5200					
	Disks / Optical	4x 2TB SATA 7200 / 1x Slim SuperMulti DVDRW SATA					
	Power Supply	700W 90% Custom PSU					
	Other	N/A					
Energy Consumption (Watts)		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	61.88 W		61.39 W		62.35 W	
	Windows Busy Typ(S0)	296.64 W		290.88 W		303.03 W	
	Windows Busy Max (S0)	338.63 W		334.85 W		333.11 W	

System Technical Specifications

	Sleep (S3)	3.99 W	3.91 W	4.02 W	4.04 W	3.99 W	3.91 W
	Off (S5)	0.86 W	0.764 W	1.02 W	0.91 W	0.86 W	0.76 W
	Zero Power Mode (ErP)	0.166 W		0.305 W		0.165 W	
Heat Dissipation (Btu/hr)		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Enabled	LAN Disabled	LAN Enabled
	Windows Idle (S0)	211.16 Btu/hr		209.47 Btu/hr		212.75 Btu/hr	
	Windows Busy Typ(S0)	1012.14 Btu/hr		992.48 Btu/hr		1033.94 Btu/hr	
	Windows Busy Max (S0)	1155.41 Btu/hr		1142.51 Btu/hr		1136.57 Btu/hr	
	Sleep (S3)	13.6 Btu/hr	13.4 Btu/hr	13.7 Btu/hr	13.8 Btu/hr	13.6 Btu/hr	13.4 Btu/hr
	Off (S5)	2.94 Btu/hr	2.60 Btu/hr	3.49 Btu/hr	3.11 Btu/hr	2.91 Btu/hr	2.58 Btu/hr
	Zero Power Mode (ErP)	0.565 Btu/hr		1.042 Btu/hr		0.563 Btu/hr	

NOTE: Power consumption measurements do not take advantage of the Intel Turbo Boost Technology. As a result, power consumption measurements may be higher.

DECLARED NOISE EMISSIONS

Declared Noise Emissions (Entry-level and High-end configurations)		
System Configuration (Entry level)	**Processor Info**	1x Intel Xeon E5-2650 v3 2.30 GHz
	Memory Info	2x 8GB DDR4-2133 MHz RDIMM
	Graphics Info	1x NVIDIA NVS 310
	Disks/Optical/Floppy	1x 1 TB SATA 7200 RPM 1x Blu-ray DVD-RW

Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)		**Sound Power** (LWAd, bels)	**Deskside Sound Pressure** (LpAm, decibels)
	Idle	3.2	14
	Hard drive Operating (random reads)	3.3	15
	DVD-ROM Operating (sequential reads)	4.3	30

System Configuration (High-end)	**Processor Info**	1x Intel Xeon E5-1660 v3 3.20 GHz
	Memory Info	8x 16GB DDR4-2133 MHz RDIMM
	Graphics Info	1x NVIDIA Quadro K4200
	Disks/Optical/Floppy	2x 600 GB SAS 15K RPM 3.5” HDD 1x Blu-ray DVD-RW

Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)		**Sound Power** (LWAd, bels)	**Deskside Sound Pressure** (LpAm, decibels)
	Idle	4.2	26
	Hard drive Operating (random reads)	4.3	27

	DVD-ROM Operating (sequential reads)	4.6	31

ENVIRONMENTAL DATA

Environmental Requirements	**Temperature**	Operating: 5° to 35° C (40° to 95° F) Non-operating: -40° to 60° C (-40° to 140° F)
	Humidity	Operating: 8% to 85% RH, non-condensing Non-operating: 8% to 90% RH, non-condensing
	Maximum Altitude	Operating: 3,000 m (10,000 feet) Non-operating: 9,100 m (30,000 feet)
	Dynamic (new)	**Shock** Operating: ½-sine: 40g, 2-3ms (~62 cm/sec) Non-operating: ½-sine: 160 cm/s, 2-3ms (~105g) square: 422 cm/s, 20g **NOTE:** Values represent individual shock events and do not indicate repetitive shock events. **Vibration** Operating random: 0.5g (rms), 5-300 Hz, up to 0.0025g²/Hz Non-operating random: 2.0g (rms), 5-500 Hz, up to 0.0150 g²/Hz **NOTE:** Values do not indicate continuous vibration.
	Cooling	Above 1524 m (5,000 ft.) altitude, maximum operating temperature is de-rated by 1° C (1.8° F) per 305 m (1,000 ft.) elevation increase

Physical Security and Serviceability	
Access Panel	Tool-less Includes system board and memory information.
Optical Drive	Tool-less
Hard Drives	Tool-less
Expansion Cards	Tool-less
Processor Socket	Tool-less
Green User Touch Points	Yes, on primary serviceable components.
Color-coordinated Cables and Connectors	Yes
Memory	Tool-less
System Board	Screw-In
Dual Color Power and HD LED on Front of Computer	Yes
Configuration Record SW	Yes
Over-Temp Warning on Screen	Yes, at POST screen on reboot
Restore CD/DVD Set	Restores the computer to its original factory shipping image; can be obtained via HP Support.

System Technical Specifications

Dual Function Front Power Switch	Yes, causes a fail-safe power off when held for 4 seconds
Padlock Support	Yes (optional): Locks side cover and secures chassis from theft 7.0 mm (0.2756 in) diameter padlock loop at rear of system
Cable Lock Support	Yes, Kensington Cable Lock (optional): Locks side cover and secures chassis from theft 3 mm x 7 mm slot at rear of system
Universal Chassis Clamp Lock Support	Yes (optional): Locks side cover and locks cables to chassis. Secures chassis from theft and allows multiple units to be chained together when used with optional cable Threaded feature at rear of system
Solenoid Lock and Hood Sensor	Yes (optional) The Solenoid Hood Lock eliminates the need for a physical key by making the chassis lockable through software and a password. You can also lock and unlock the chassis remotely over the network. The Sensor Kit detects when the access panel has been removed
Serial, Parallel, USB, Audio, Network, Enable/Disable Port Control	Yes, enables or disables serial, USB, audio, and network ports
Removable Media Write/Boot Control	Yes, prevents ability to boot from removable media on supported devices (and can disable writes to media)
Power-On Password	Yes, prevents an unauthorized person from booting up the workstation
Setup Password	Yes, prevents an unauthorized person from changing the workstation configuration
3.3V Aux Power LED on System PCA	Yes
NIC LEDs (integrated) (Green & Amber)	Yes
CPUs and Heatsinks	A T-15 Torx or flat blade screwdriver is needed to remove the CPU heatsink before the CPU can be removed. CPU removal is tool-less
Power Supply Diagnostic LED	Yes
Front Power Button	Yes, ACPI multi-function
Rear Power Button	Yes
Front Power LED	Yes, white (normal), red (fault)
Front Hard Drive Activity LED	Yes, white
Front ODD Activity LED	Yes, on device
Internal Speaker	Yes
System/Emergency ROM Flash Recovery	Recovers corrupted system BIOS.
Cooling Solutions	Air cooled forced convection heatsinks
Power Supply Fans	92 mm x 92 mm x 25 mm (non-serviceable)
CPU Heatsink Fan	92 mm x 25 mm, 6-wire, PWM
Chassis Fan	Front: (Optional) 92 mm x 92mm x 25 mm, 4-wire, PWM Rear: 92 mm x 92mm x 25 mm, 4-wire, PWM

System Technical Specifications

Memory Heatsink Fan	Dual 60 mm x 60 mm x 25 mm, 6-wire, PWM, Blindmate
HP PC Hardware Diagnostics UEFI	HP Vision Diagnostics Offline Edition The diagnostics utility enables you to perform testing and to view critical computer hardware and software configuration information from various sources. This utility enables you to: • Run diagnostics • View the hardware configuration of the system Key features and benefits HP Vision Diagnostics simplifies the process of effectively identifying, diagnosing, and isolating the hardware issues. In addition to robust management tools, service tools can be invaluable in quickly resolving system problems. To streamline the service process and resolve problems quickly, it is necessary to have the right information available at the time that a service call is placed. The primary information requirement, which is also the one that provides the greatest Vision into potential system issues, is the configuration of the system. Vision Diagnostics helps provide higher system availability. Typical uses of the Vision Diagnostics are: • Testing and diagnosing apparent hardware failures • Documenting system configurations for upgrade planning, standardization, inventory tracking, disaster recovery, and maintenance • Sending configuration information to another location for more in-depth analysis • Entered using F2
Access Panel Key Lock	No
ACPI-Ready Hardware	Advanced Configuration and Power Management Interface (ACPI). • Allows the system to wake from a low-power mode. • Controls system power consumption, making it possible to place individual cards and peripherals in a low-power or powered-off state without affecting other elements of the system
Trusted Platform Module Chip	Infineon TPM 1.2 Certified
Integrated Chassis Handles	Yes, Front handle and dedicated rear recess
Power Supply	Requires T15 Torx or flat blade screwdriver
PCIe Card Retention	Yes, rear (all), middle (all), front (full-length cards with extender, using HP Z4 Fan and Front Card Guide Kit)
Flash ROM	Yes
Diagnostic Power Switch LED on board	Yes
Clear Password Jumper	Yes
Clear CMOS Button	Yes
CMOS Battery Holder	Yes
DIMM Connectors	Yes

BIOS

System Technical Specifications

BIOS 32-bit Services	Standard BIOS 32-bit Service Directory Proposal v0.4
PCI 3.0 Support	Full BIOS support for PCI Express through industry standard interfaces.
ATAPI	ATAPI Removable Media Device BIOS Specification Version 1.0.
BBS	BIOS Boot Specification v1.01.
WMI Support	WMI is Microsoft's implementation of Web-Based Enterprise Management (WBEM) for Windows. WMI is fully compliant with the Distributed Management Task Force (DMTF) Common Information Model (CIM) and WBEM specifications.
BIOS Boot Spec 1.01+	Provides more control over how and from what devices the workstation will boot.
BIOS Power On	Users can define a specific date and time for the system to power on.
ROM Based Computer Setup Utility (F10)	Review and customize system configuration settings controlled by the BIOS.
System/Emergency ROM Flash Recovery with Video	Recovers system BIOS in corrupted Flash ROM.
Replicated Setup	Saves BIOS settings to diskette or USB flash device in human readable file. Repset.exe utility can then replicate these settings on machines being deployed without entering Computer Configuration Utility (F10 Setup).
SMBIOS	System Management BIOS 2.7, for system management information.
Boot Control	Disables the ability to boot from removable media on supported devices.
Memory Change Alert	Alerts management console if memory is removed or changed.
Thermal Alert	Monitors the temperature state within the chassis. Three modes: • NORMAL - normal temperature ranges. • ALERTED - excessive temperatures are detected. Raises a flag so action can be taken to avoid shutdown or provide for a smoother system shutdown. • SHUTDOWN - excessive temperatures are encountered. Automatically shuts down the computer without warning before hardware component damage occurs.
Remote ROM Flash	Provides secure, fail-safe ROM image management from a central network console.
ACPI (Advanced Configuration and Power Management Interface)	Allows the system to enter and resume from low power modes (sleep states). Enables an operating system to control system power consumption based on the dynamic workload. Makes it possible to place individual cards and peripherals in a low-power or powered-off state without affecting other elements of the system. Supports ACPI 2.0 for full compatibility with 64-bit operating systems.
Ownership Tag	A user-defined string stored in non-volatile memory that is displayed in the BIOS splash screen.
Remote Wakeup/Remote Shutdown	System administrators can power on, restart, and power off a client computer from a remote location.
Instantly Available PC (Suspend to RAM - ACPI sleep state S3)	Allows for very low power consumption with quick resume time.
Remote System Installation via F12 (PXE 2.1) (Remote Boot from Server)	Allows a new or existing system to boot over the network and download software, including the operating system.
ROM revision levels	Reports the system BIOS revision level in Computer Configuration Utility (F10 Setup). Version is available through an industry standard interface (SMBIOS) so that management SW applications can use and report this information.
System board revision level	Allows management SW to read revision level of the system board. Revision level is digitally encoded into the HW and cannot be modified.
Start-up Diagnostics (Power-on Self-Test)	Assesses system health at boot time with selectable levels of testing.
Auto Setup when new	System automatically detects addition of new hardware.

System Technical Specifications

hardware installed	
Keyboard-less Operation	The system can be booted without a keyboard.
Localized ROM Setup	Common BIOS image supports System Configuration Utility (F10 Setup) menus in 12 languages with local keyboard mappings.
Asset Tag	The user or MIS to set a unique tag string in non-volatile memory.
Per-slot Control	Allows I/O slot parameters (option ROM enable/disable, bus latency) to be configured individually.
Adaptive Cooling	Control parameters are set according to detected hardware configuration for optimal acoustics.
Pre-boot Diagnostics	(Pre-video) critical errors are reported via beeps and blinks on the power LED.
Industry Standard Specification Support	
Industry Standard	Revision Supported by the BIOS
UEFI Specification Revision	2.3.1
ACPI	Advanced Configuration and Power Management Interface, Version 2.0c
ATA (IDE)	AT Attachment 6 with Packet Interface (ATA/ATAPI-6), Revision 3b
CD Boot	"El Torito" Bootable CD-ROM Format Specification Version 1.0
EDD	- Enhanced Disk Drive Specification Version 1.1 - BIOS Enhanced Disk Drive Specification Version 3.0
EHCI	Enhanced Host Controller Interface for Universal Serial Bus, Revision 1.0
PCI	PCI Local Bus Specification, Revision 2.3 PCI Power Management Specification, Revision 1.1 PCI Firmware Specification, Revision 3.0, Draft .7
PCI Express	PCI Express Base Specification, Revision 2.0 PCI Express Base Specification, Revision 3.0
PMM	POST Memory Manager Specification, Version 1.01
SATA	Serial ATA Specification, Revision 1.0a Serial ATA 3 Gb/s: Serial ATA Specification, Revision 2.5 Serial ATA 6 Gb/s: Serial ATA Specification, Revision 3.0
SPD	PC SDRAM Serial Presence Detect (SPD) Specification, Revision 1.2B
TPM	Trusted Computing Group TPM Specification Version 1.2
UHCI	Universal Host Controller Interface Design Guide, Revision 1.1
USB	Universal Serial Bus Revision 1.1 Specification Universal Serial Bus Revision 2.0 Specification Universal Serial Bus Revision 3.0 Specification
SMBIOS	System Management BIOS Reference Specification, Version 2.7 External BIOS simulator found at: http://h20464.www2.hp.com/index.html

Social and Environmental Responsibility

Eco-Label Certifications & Declarations	This product has received or is in the process of being certified to the following approvals and may be labeled with one or more of these marks: • ENERGY STAR® (energy-saving features available on selected configurations-Windows only) • US Federal Energy Management Program (FEMP)

System Technical Specifications

	• China Energy Conservation Program • The ECO declaration (TED)
Batteries	The battery in this product complies with EU Directive 2006/66/EC Battery size: CR2032 (coin cell) Battery type: Lithium Metal The battery in this product does not contain: • Mercury greater than 5ppm by weight • Cadmium greater than 10ppm by weight • Lead greater than 40ppm by weight
Restricted Material Usage	This product meets the material restrictions specified in HP's General Specification for the Environment. http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/gse.pdf Hewlett-Packard is committed to compliance with all applicable environmental laws and regulations, including the European Union Restriction of Hazardous Substances (RoHS) Directive. HP's goal is to exceed compliance obligations by meeting the requirements of the RoHS Directive on a worldwide basis.
Low Halogen Statement	This product is low-halogen except for power cords, external cables and peripherals. The following customer-configurable internal components may not be low-halogen: 3 ½" SAS HDDs and LSI 9217-4i4e SAS ROC RAID Card. Service parts obtained after purchase may not be low-halogen.
End-of-Life Management and Recycling	Hewlett-Packard offers end-of-life HP product return and recycling programs in many geographic areas. To recycle your product, please go to: http://www.hp.com/recycle or contact your nearest HP sales office. Products returned to HP will be recycled, recovered or disposed of in a responsible manner. This product is greater than 90% recyclable by weight when properly disposed of at end of life.
Hewlett-Packard Corporate Environmental Information	For more information about HP's commitment to the environment: Global Citizenship Report http://www.hp.com/hpinfo/globalcitizenship/gcreport/index.html Eco-label certifications http://www.hp.com/hpinfo/globalcitizenship/environment/productdesign/ecolabels.html ISO 14001 certificates: http://www.hp.com/hpinfo/globalcitizenship/environment/operations/envmanagement.html
Additional Information	• This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive – 2002/96/EC. http://www.hp.com/hpinfo/globalcitizenship/environment/productdata/disassemblyworkstatio.html • Plastic parts weighing over 25 grams used in the product are marked per ISO 11469 and ISO1043. • EPEAT Gold - ENERGY STAR qualified configurations of this product are in compliance with the IEEE 1680 (EPEAT) standard at the Gold level where HP registers workstation products. See http://ww2.epeat.net/CompanyDetail.aspx?CompanyID=24 for registration status in your country.
Packaging	HP Workstation product packaging meets the HP General Specification for the Environment at http://www.hp.com/hpinfo/globalcitizenship/society/gen_specifications.html • Does not contain restricted substances listed in HP Standard 011-1 General Specification for the Environment • Does not contain ozone-depleting substances (ODS) • Does not contain heavy metals (lead, mercury, cadmium or hexavalent chromium) in excess of 100 ppm sum total for all heavy metals listed

System Technical Specifications

	• Maximizes the use of post-consumer recycled content materials in packaging materials • All packaging material is recyclable • All packaging material is designed for ease of disassembly • Reduced size and weight of packages to improve transportation fuel efficiency • Plastic packaging materials are marked according to ISO 11469 and DIN 6120 standards formatting
Packaging Materials	
Internal	Cushions and plastic bags made of low density polyethylene (LDPE).
External	Outer carton, accessories carton, and insert made of corrugated paper board.

Manageability	
Industry Standard Specifications	This product meets the following industry standard specifications for manageability functionality: • DASH 1.1 (via Intel® LAN on motherboard)
Intel Active Management Technology (AMT)	Intel® Active Management Technology (AMT) 9.1 An advanced set of remote management features and functionality providing IT administrators the latest and most effective tools to remotely discover, heal, and protect networked client systems regardless of the system's health or power state. AMT 9.1 includes the following advanced management functions: • Power Management (on, off, reset, graceful shutdown, sleep and hibernate) ○ Support in Max Power Savings (Shutdown and Hibernate Modes) • Hardware Inventory (includes BIOS and firmware revisions) • Hardware Alerting • Agent Presence • System Defense Filters • Serial Over LAN (SOL) • IDE Redirect • ME Wake-on-LAN (WOL) • DASH 1.1 compliance • IPv6 Support • Fast Call for Help - a client inside or outside the firewall may initiate a call for help via BIOS screen, periodic connections, or alert triggered connection • Remote Scheduled Maintenance - pre-schedule when the system connects to the IT or service provider console for maintenance. • Remote Alerts - automatically alert IT or service provider if issues arise • Access Monitor - Provides oversight into Intel® AMT actions to support security requirements • PC Alarm Clock • Microsoft NAP Support • Host Base set-up and configuration • Management Engine (ME) firmware roll back • Local Time Sync to UTC • Remote Memory Dump Command – Creates memory dump for debug
Intel® vPro™ Technology	The HP Z440 Workstation supports Intel® vPro technology when configured as outlined below: • Intel® Xeon processor E5-1600 v3 or E5-2600 v3 product family featuring Intel® vPro Technology • Intel® C612 chipset

System Technical Specifications

	• Intel® I218LM GbE LAN
Remote Manageability Software Solutions	The HP Z440 Workstation is supported on the following remote manageability software consoles: • LANDesk Management Suite (HP recommended solution) • Microsoft System Center Configuration Manager • HP Client Automation Enterprise For questions or support for manageability needs, please visit http://www.hp.com/go/easydeploy
System Software Manager	For questions or support for SSM, please visit: http://www.hp.com/go/ssm
Service, Support, and Warranty	On-site Warranty and Service (Note 1): Three-years, limited warranty and service offering delivers on-site, next business-day (Note 2) service for parts and labor and includes free telephone support (Note 3) 8am - 5pm. Global coverage (Note 2) ensures that any product purchased in one country and transferred to another, non-restricted country will remain fully covered under the original warranty and service offering. **NOTE 1:** Terms and conditions may vary by country. Certain restrictions and exclusions apply. **NOTE 2:** On-site service may be provided pursuant to a service contract between HP and an authorized HP third-party provider, and is not available in certain countries. Global service response times are based on commercially reasonable best effort and may vary by country. **NOTE 3:** Technical telephone support applies only to HP-configured, HP and HP-qualified, third-party hardware and software. Toll-free calling and 24x7 support service may not be available in some countries. HP Care Pack Services extend service contracts beyond the standard warranties. Service starts from date of hardware purchase. To choose the right level of service for your HP product, use the HP Care Pack Services Lookup Tool at: http://www.hp.com/go/lookuptool. Additional HP Care Pack Services information by product is available at: http://www.hp.com/hps/carepack. Service levels and response times for HP Care Packs may vary depending on your geographic location.
Product Change Notification	• Program to proactively communicate Product Change Notifications (PCNs) and Customer Advisories by email to customers, based on a user-defined profile. • PCNs provide advance notification of hardware and software changes to be implemented in the factory providing time to plan for transition. • Customer Advisories provide concise, effective problem resolution, greatly reducing the need to call technical support.

Stable & Consistent Offerings

As part of its commitment to hardware, software, and solution innovation, HP is proud to introduce this breakthrough platform configuration stability to HP Workstation customers. HP Stable & Consistent Offerings are built on the foundation of a carefully chosen set of hardware and software designed and tested to work with all HP Z Workstation platforms through their end of life. These components and their corresponding HP Workstation platform compatibility are outlined in this section.

HP Stable & Consistent Offerings are available worldwide to all HP Workstation customers-no special programs, no additional cost-no kidding. Simply select your hardware and software components when you customize your HP Workstation and be assured that you'll be able to buy that same configuration throughout the lifecycle of the product.

Processors	**Product #**	**Offering**
	J6S68AV	Intel Xeon E5-1620 v3 3.5GHz 4-core 10MB 2133
	J6S71AV	Intel Xeon E5-2630 v3 2.4GHz 8-core 20MB 1866

Hard Drives	**Product #**	**Offering**
	J3H77AV	500GB 7200 RPM SATA 1st Hard Disk Drive
	J3H98AV	500GB 7200 RPM SATA 2nd Hard Disk Drive
	J3J19AV	500GB 7200 RPM SATA 3rd Hard Disk Drive
	J3J39AV	500GB 7200 RPM SATA 4th Hard Disk Drive
	J3H78AV	1TB 7200 RPM SATA 1st Hard Disk Drive
	J3H99AV	1TB 7200 RPM SATA 2nd Hard Disk Drive
	J3J20AV	1TB 7200 RPM SATA 3rd Hard Disk Drive
	J3J40AV	1TB 7200 RPM SATA 4th Hard Disk Drive

Graphics	**Product #**	**Offering**
	J1P69AV	NVIDIA NVS 510 2GB 1st Graphics
	J1P81AV	NVIDIA NVS 510 2GB 2nd Graphics
	J1P71AV	NVIDIA Quadro K620 2GB 1st Graphics
	J1P83AV	NVIDIA Quadro K620 2GB 2nd Graphics
	J1P72AV	NVIDIA Quadro K2200 4GB 1st Graphics
	J1P84AV	NVIDIA Quadro K2200 4GB 2nd Graphics
	J1P76AV	AMD FirePro W2100 2GB 1st Graphics
	J1P85AV	AMD FirePro W2100 2GB 2nd Graphics

Memory	**Product #**	**Offering**
	G8U28AV	8GB DDR4-2133 (1x8GB) Registered RAM
	G8U32AV	16GB DDR4-2133 (2x8GB) Registered RAM
	G8U34AV	32GB DDR4-2133 (4x8GB) Registered RAM
	G8U36AV	64GB DDR4-2133 (8x8GB) Registered RAM
	G8U35AV	32GB DDR4-2133 (2x16GB) Registered RAM
	G8U37AV	64GB DDR4-2133 (4x16GB) Registered RAM
	G8U38AV	128GB DDR4-2133 (8x16GB) Registered RAM

Stable & Consistent Offerings

Optical and Removable Storage	Product #	Offering
	F5W18AV	Slim SuperMulti DVDRW SATA 1st Optical Disk Drive
	G8U22AV	Slim SuperMulti DVDRW SATA 2nd Optical Disk Drive

STORAGE/HARD DRIVES

HP SAS (Serial Attached SCSI) Hard Drives for HP Workstations	**600GB SAS 15K rpm 6Gb/s 3.5" HDD**	**Capacity**	600GB	
		Height	1 in; 2.54 cm	
		Width	**Media Diameter**	3.5 in; 8.9 cm
			Physical Size	4 in; 10.17 cm
		Interface	SAS	
		Synchronous Transfer Rate (Maximum)	6.0 Gb/s	
		Buffer	16 MB	
		Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	0.2 ms
			Average	3.4 ms
			Full Stroke	6.6 ms
		Rotational Speed	15,000 rpm	
		Logical Blocks	1,172,123,568 - 512 byte blocks	
		Operating Temperature	50° to 95° F (10° to 35° C)	
	300GB SAS 15K rpm 6Gb/s 3.5" HDD	**Capacity**	300GB	
		Height	1 in; 2.54 cm	
		Width	**Media Diameter**	3.5 in; 8.9 cm
			Physical Size	4 in; 10.17 cm
		Interface	SAS	
		Synchronous Transfer Rate (Maximum)	6Gb/s	
		Buffer	16MB	
		Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	0.2 ms
			Average	3.4 ms
			Full Stroke	6.6 ms
		Rotational Speed	15,000 rpm	
		Operating Temperature	50° to 95° F (10° to 35° C)	
	HP 300GB SAS 10K SFF HDD	**Capacity**	300GB	
		Height	0.6 in; 1.53 cm	
		Width	**Media Diameter**	2.5 in; 6.36 cm
			Physical Size	2.75 in; 6.99 cm
		Interface	SAS 6Gb/s	
		Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
		Buffer	64MB	
		Cache	multi-segmentable cache buffer	
		Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	0.4 ms (max)
			Average	3.6 ms
			Full Stroke	7.3 ms

Technical Specifications - Hard Drives

		Rotational Speed	10,000 rpm	
		Logical Blocks	585,937,500	
		Operating Temperature	41° to 131° F (5° to 55° C)	
	HP 600GB SAS 10K SFF HDD	**Capacity**	600GB	
		Height	0.6 in; 1.53 cm	
		Width	**Media Diameter**	2.5 in; 6.36 cm
			Physical Size	2.75 in; 6.99 cm
		Interface	SAS 6Gb/s	
		Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
		Buffer	64MB	
		Cache	multi-segmentable cache buffer	
		Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	0.4 ms (max)
			Average	3.6 ms
			Full Stroke	7.3 ms
		Rotational Speed	10,000 rpm	
		Logical Blocks	1,172,123,568	
		Operating Temperature	41° to 131° F (5° to 55° C)	
	HP 1.2TB SAS 10K SFF HDD	**Capacity**	1.2TB	
		Height	0.6 in; 1.53 cm	
		Width	**Media Diameter**	2.5 in; 6.36 cm
			Physical Size	2.75 in; 6.99 cm
		Interface	SAS 6Gb/s	
		Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
		Buffer	64MB	
		Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	0.18ms (max)
			Average	3.5ms
			Full Stroke	7.17ms
		Rotational Speed	10,000 rpm	
		Logical Blocks	2,344,225,968	
		Operating Temperature	41° to 131° F (5° to 55° C)	
SATA (Serial ATA) Hard Drives for HP Workstations	**500GB SATA 7200 rpm 6Gb/s 3.5" HDD**	**Capacity**	500GB	
		Height	1 in; 2.54 cm	
		Width	**Media Diameter**	3.5 in; 8.9 cm
			Physical Size	4 in; 10.17 cm
		Interface	Serial ATA (6.0Gb/s), NCQ enabled	
		Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
		Buffer	16MB	
		Seek Time (typical reads,	**Single Track**	2 ms

Technical Specifications - Hard Drives

	includes controller overhead, including settling)	**Average**	11 ms
		Full Stroke	21 ms
	Rotational Speed	7,200 rpm	
	Logical Blocks	976,773,168	
	Operating Temperature	41° to 131° F (5° to 55° C)	
1TB SATA 7200 rpm 6Gb/s 3.5" HDD	**Capacity**	1TB	
	Height	1 in; 2.54 cm	
	Width	**Media Diameter**	3.5 in; 8.9 cm
		Physical Size	4 in; 10.17 cm
	Interface	Serial ATA (6.0Gb/s), NCQ enabled	
	Synchronous Transfer Rate (Maximum)	Up to 600 MB/s	
	Buffer	64MB	
	Cache	Adaptive	
	Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	2 ms
		Average	11 ms
		Full Stroke	21 ms
	Rotational Speed	7,200 rpm	
	Operating Temperature	41° to 131° F (5° to 55° C)	
2.0TB SATA 7200 rpm 6Gb/s 3.5" HDD	**Capacity**	2.0TB	
	Height	1 in; 2.54 cm	
	Width	**Media Diameter**	3.5 in; 8.9 cm
		Physical Size	4 in; 10.17 cm
	Interface	Serial ATA (6.0 Gb/s), NCQ Enabled	
	Synchronous Transfer Rate (Maximum)	Up to 600 MB/s	
	Buffer	64MB	
	Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	1.0 ms
		Average	11 ms
		Full Stroke	18 ms
	Rotational Speed	7,200 rpm	
	Logical Blocks	3,907,029,168	
	Operating Temperature	41° to 131° F (5° to 55° C)	
3.0TB SATA 7200 rpm 6Gb/s 3.5" HDD	**Capacity**	3.0TB	
	Height	1 in; 2.54 cm	
	Width	**Media Diameter**	3.5 in; 8.9 cm
		Physical Size	4.0 in; 10.17 cm
	Interface	Serial ATA (6.0Gb/s), NCQ enabled	
	Synchronous Transfer Rate (Maximum)	Up to 6.0 Gb/s	
	Buffer	64MB	
	Seek Time (typical reads,	**Single Track**	0.6 ms

		includes controller overhead, including settling)	**Average**	11 ms
			Full Stroke	Not Specified
		Rotational Speed	7,200 rpm	
		Operating Temperature	41° to 140° F (5° to 60° C)	
HP Solid State Drives (SSDs) for Workstations	**HP 128GB SATA 6Gb/s SSD**	**Capacity**	128GB	
		Height	0.28 in; 0.7 cm	
		Width	**Physical Size**	2.5 in; 6.36 cm
		Interface	SATA 6Gb/s	
		Synchronous Transfer Rate (Maximum)	Up to 500MB/s (Sequential Read)	
		Operating Temperature	32° to 158° F (0° to 70° C)	
	HP 256GB SATA 6Gb/s SSD	**Capacity**	256GB	
		Height	0.28 in; 0.7 cm	
		Interface	SATA 6Gb/s	
		Synchronous Transfer Rate (Maximum)	Up to 500MB/s (Sequential Read)	
		Operating Temperature	32° to 158° F (0° to 70° C)	
	HP 256GB SATA 6Gb/s SED SSD	**Capacity**	256GB	
		Height	0.28 in; 0.7 cm	
		Width	**Physical Size**	2.5 in; 6.36 cm
		Interface	6Gb/s SATA	
		Synchronous Transfer Rate (Maximum)	Up to 500MB/s (Sequential Read)	
		Operating Temperature	32° to 158° F (0° to 70° C)	
	HP 512GB SATA 6Gb/s SSD	**Capacity**	512GB	
		Height	0.28 in; 0.7 cm	
		Width	**Physical Size**	2.5 in; 6.36 cm
		Interface	6Gb/s SATA	
		Synchronous Transfer Rate (Maximum)	Up to 500MB/s (Sequential Read)	
		Operating Temperature	32° to 158° F (0° to 70° C)	
	HP 1TB SATA 6Gb/s SSD	**Capacity**	1TB	
		Height	0.28 in; 0.7 cm	
		Width	**Physical Size**	2.5 in; 6.36 cm
		Interface	6Gb/s SATA	
		Synchronous Transfer Rate (Maximum)	Up to 550MB/s (Sequential Read)	
		Operating Temperature	32° to 158° F (0° to 70° C)	

Technical Specifications - Hard Drives

	Samsung Enterprise 240GB SATA SSD	**Capacity**	240GB	
		Width	**Physical Size**	2.5 in; 6.36 cm
		Interface	SATA 6Gb/s	
		Synchronous Transfer Rate (Maximum)	600 Mb/s	
	Samsung Enterprise 480GB SATA SSD	**Capacity**	480GB	
		Width	**Physical Size**	2.5 in; 6.36 cm
		Interface	SATA 6Gb/s	
		Synchronous Transfer Rate (Maximum)	600 Mb/s	
	Intel Pro 1500 180GB SATA SSD	**Capacity**	180GB	
		Width	**Physical Size**	2.5 in; 6.36 cm
		Interface	6Gb/s SATA	
		Synchronous Transfer Rate (Maximum)	600 Mb/s	
		Operating Temperature	32° to 158° F (0° to 70° C)	
PCIe SSDs for HP Workstations	**HP Z Turbo Drive 256GB SSD**	**Capacity**	256GB	
		Interface	PCI Express 2.0 x4 electrical x4 physical	
		Operating Temperature	32° to 158° F (0° to 70° C)	
	HP Z Turbo Drive 512GB SSD	**Capacity**	512GB	
		Interface	PCI Express 2.0 x4 electrical x4 physical	
		Operating Temperature	32° to 158° F (0° to 70° C)	

HARD DRIVE CONTROLLERS

LSI 9217-4i4e 8-port SAS 6Gb/s RAID Card	**PCI Bus**	8 lanes, PCI Express 3.0	
	RAID Levels	Offers Integrated RAID (0, 1, 1E and 10)	
	PCI Data Burst Transfer Rate	Half Duplex x8, PCIe, 8000 MB/s	
	SAS Bandwidth	**Half Duplex**	600 MB/s per lane
	PCI Card Type	3.3V Add-in Card	
	PCI Voltage	12 V ± 10%	
	PCI Power	9.8W typical, Airflow min 200 LFM	
	Bracket	Full height and low profile	
	Certification Level	PCI Express 3.0 compliant	
	SAS Processor	LSI SAS2308/ Fusion MPT 2.0	
	Internal Connectors	One x4 internal mini-SAS (SFF8087)	
	External Connectors	One x4 external mini-SAS (SFF8088)	
	Maximum Number of SCSI Devices	256 Non-RAID SAS/SATA devices	
	LED Indicators	N/A	

GRAPHICS

NVIDIA NVS 310 512MB Graphics	**Form Factor**	Low Profile: 2.7 inches (H) x 5.7 inches (L), Half-Height
	Weight:	~142 grams
	Graphics Controller	NVIDIA NVS 310 GPU: GF119-825
	Bus Type	PCI Express x16, 2.0 compliant
	Memory	Size: 512MB DDR3 Clock: 875Mhz Memory Bandwidth: 14GB/s
	Connectors	2 x DisplayPort
	Maximum Resolution	Up to 2560 x 1600 (digital display) per display.
	Image Quality Features	The following video formats are supported: - MPEG2 - MPEG4 Part 2 Advanced Simple Profile - H.264 SVC codec support - Support for 3D Blu Ray - VC1 - DivX version 3.11 and later - MVC A full range of video resolutions are supported including 1080p, 1080i, 720p, 480p and 480i. The NVS 310 GPU provides hardware acceleration for the computationally intensive parts of video processing, as well as provides improved video playback speeds via faster decode and transcode.
	Display Output	Up to 2 displays in the following configurations: DisplayPort output: • Drives two DisplayPort enabled digital display at resolutions up to 2560 × 1600 at 60 Hz with reduced blanking, when connected natively using the 2 DisplayPort connectors on the NVS 310 graphics card • Supports 2 monitors up to resolution of 1920 × 1200 at 60 Hz with reduced blanking using DisplayPort 1.2 multi stream topology technology. DVI-D output: • Drives two digital display at resolutions up to 1920 × 1200 at 60 Hz with reduced blanking using DisplayPort to DVI-D single-link cable adaptors

		• Drives two digital display at resolutions up to 2560× 1600 at 60 Hz with reduced blanking using DisplayPort to DVI-D dual-link cable adaptors HDMI output: • NVS 310 is capable of driving two high definition (HD) panels up to resolutions of 1920 × 1080P at 60 Hz using DisplayPort to HDMI cable adaptors VGA display output: • Drives two analog display at resolutions up to 1920 × 1200 at 60 Hz using DisplayPort to VGA cable adaptors
	Shading Architecture	Shader Model 5.0
	Supported Graphics APIs	DX11, OpenGL 4.1
	Available Graphics Drivers	Windows 8 Genuine Windows 7 Professional (64-bit and 32-bit) Microsoft Windows XP Professional (64-bit and 32-bit) Red Hat Enterprise Linux(RHEL) SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit) HP qualified drivers may be preloaded or the latest HP qualified drivers are available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html SUSE Linux Enterprise drivers may also be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
	Notes	1. The thermal solution used on this card is an active fan heatsink. 2. Factory configured NVS 310 graphics card have no cable adapters included. Adapters must be ordered separately. 3. Option kit NVS 310 includes 2 DP to DVI-D cable adapters.
NVIDIA NVS 315 1 GB Graphics	**Form Factor**	Low Profile: 2.713 inches in height × 5.7 inches in length Weight: ~142 grams
	Graphics Controller	NVIDIA NVS 315 (using GF119-825 GPU) Number of Cores: 48 CUDA cores Max. Power: 19.3W Cooling Solution: Active fan heatsink
	Bus Type	PCI Express x16, 2.0 compliant
	Memory	Size: 1GB DDR3 Clock: 875Mhz Memory Bandwidth: 14GB/s
	Connectors	DMS-59 output

Technical Specifications - Graphics

	Cables included: - For CTO: DMS-59 to DVI cable - For AMO: DMS-59 to DVI cable and DMS-59 to VGA cable
Maximum Resolution	Maximum number of displays supported: 2 Maximum Resolution Support: - DMS-59 to VGA: 2048 x 1536 @ 85Hz - DMS-59 to DVI: 1980 x 1200 @ 60Hz - DMS-59 to DP: 2560 x 1600 @ 60Hz
Image Quality Features	See Display Output section. The following video formats are supported: - MPEG2 - MPEG4 Part 2 Advanced Simple Profile - H.264 SVC codec support - Support for 3D Blu Ray - VC1 - DivX version 3.11 or later A full range of video resolutions are supported including 1080p, 1080i, 720p, 480p and 480i. The NVS 315 GPU provides hardware acceleration for the computationally intensive parts of video processing, as well as provides improved video playback speeds via faster decode and transcode.
Display Output	Up to 2 displays using one of the following DMS-59 cables: - DMS-59 to DVI - DMS-59 to VGA - DMS-59 to DP DisplayPort output: • Drives two DisplayPort enabled digital displays at resolutions up to 2560 × 1600 at 60 Hz with reduced blanking, when connected via the DMS-59 to DP adapter. DVI-D output: • Drives two digital display at resolutions up to 1920 × 1200 at 60 Hz with reduced blanking using DMS-59 to DVI-D single-link cable adaptor VGA display output: • Drives two analog displays at resolutions up to 2048 × 1536 at 85 Hz using DMS-59 to VGA cable adaptor.
Shading Architecture	Shader Model 5.0

Technical Specifications - Graphics

	Supported Graphics APIs	DX11, OpenGL 4.3
	Available Graphics Drivers	Windows 8 Microsoft Windows 7 Professional (64-bit and 32-bit) Microsoft Windows XP Professional (64-bit and 32-bit) Red Hat Enterprise Linux(RHEL) SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit) HP qualified drivers may be preloaded or the latest HP qualified drivers are available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html SUSE Linux Enterprise drivers may also be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
	Notes	1. The thermal solution used on this card is an active fan heatsink. 2. Factory configured NVS 310 graphics card have no cable adapters included. Adapters must be ordered separately. 3. Option kit graphics card includes DMS-59 to DVI and DMS-59 to VGA cables (one each).
NVIDIA NVS 510 2GB Graphics	**Form Factor**	Low Profile, 2.713 inches × 6.3 inches, single slot
	Graphics Controller	NVS 510 GPU Core Clock: 797 MHz Memory Clock: 891 MHz CUDA Cores: 192
	Bus Type	PCI Express x16, Generation 2.0
	Memory	2GB DDR3
	Connectors	Four mini-DisplayPort. Four mini-DisplayPort-to-DisplayPort adapters included. (DisplayPort to DVI-D, DisplayPort to VGA, DisplayPort to HDMI, and DisplayPort to Dual-Link DVI adapters available as separate accessories)
	Maximum Resolution	Mini-DisplayPort connectors support ultra-high-resolution panels (up to 3840 x 2160 @ 60Hz) Note: This card supports up to four displays. For Windows XP, only 2 active displays are supported.
	Image Quality Features	10-bit internal display processing, including hardware support for 10-bit scan-out
	Display Output	DisplayPort with Multi-Stream Technology (MST) and High Bit Rate 2 (HBR2) support. **Digital Display Support** **DisplayPort Output** • Drives four DisplayPort enabled digital display at resolutions up to 3840 × 2160 at 60 Hz with reduced blanking, when connected natively using the 4 DisplayPort connectors on the NVS 510 graphics card.

- DisplayPort Multi-Stream Topology (MST) Technology: Supports various combinations of display resolutions and number of displays when using DisplayPort multi stream topology technology – up to a maximum of 4 monitors at a resolution of 1920 × 1200 at 60 Hz with reduced blanking.

DVI-D Output

- Drives four digital displays at resolutions up to 1920 × 1200 at 60 Hz with reduced blanking using DisplayPort to DVI-D single-link cable adaptors.
- Drives four digital displays at resolutions up to 2560× 1600 at 60 Hz with reduced blanking using DisplayPort to DVI-D dual-link cable adaptors.

HDMI Output

- The NVS 510 graphics board is capable of driving four high definition (HD) panels up to resolutions of 1920 × 1080P at 60 Hz using DisplayPort to HDMI cable adaptors.

Analog Display Support

VGA display output

- Drives four analog displays at resolutions up to 1920 × 1200 at 60 Hz using DisplayPort to VGA cable adaptors.

	Supported Graphics APIs	Full Microsoft DirectX 11, Shader Model 5.0 support Full OpenGL 4.3 support
	Available Graphics Drivers	Genuine Windows 7 Professional (64-bit and 32-bit) Microsoft Windows XP Professional (64-bit and 32-bit) Red Hat Enterprise Linux(RHEL) 6 Desktop/Workstation SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit) HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html
	Notes	Heatsink cooler design is active.
NVIDIA Quadro K620 2GB Graphics	**Form Factor**	2.713" H x 6.3" L Single Slot, Low Profile Full Height Profile bracket installed Low Profile bracket included Weight: 133 grams
	Graphics Controller	NVIDIA Quadro K620 Graphics Card GM107 GPU 384 CUDA cores Max Power: 45 Watts
	Bus Type	PCI Express 2.0 x16
	Memory	2 GB GDDR3, 900 MHz 128-bit memory I/O path 29 GB/s memory bandwidth

Technical Specifications - Graphics

	Connectors	1 DL-DVI(I) output, 1 DisplayPort output Factory Configured: No video cable adapter included Option Kit: One DP-to-DVI adapter included with card Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as Factory Configuration or Option Kit accessories.
	Maximum Resolution	DisplayPort 1.2: - up to 4096x2160 x 30 bpp @ 60Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST) Dual Link DVI(I) output: - up to 2560 x 1600 x 32 bpp @ 60Hz Single Link-DVI(I) output: - up to 1920 x 1200 x 32 bpp @ 60Hz
	Image Quality Features	10-bit internal display processing pipeline 10-bit scan-out support
	Display Output	1 Dual-link DVI-I connector 1 Display Port connector
	Shading Architecture	Full Microsoft DirectX 11.1 Shader Model 5.0
	Supported Graphics APIs	OpenGL 4.4 DirectX 11.1 API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran
	Available Graphics Drivers	Microsoft Windows 8.1 Microsoft Windows 8 Microsoft Windows 7 Linux HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html
	Notes	1. Factory configured Quadro K620 does not include a video cable adapter. Video cable adapters must be ordered separately. 2. Quadro K620 offered as an Option Kit (AMO) includes one DP-to-DVI video cable adapter. Additional cables must be ordered separately.
NVIDIA Quadro K420 1GB Graphics	**Form Factor**	Low Profile: 2.713 inches × 6.3 inches, single slot
	Graphics Controller	NVIDIA Quadro K420 GPU: GK107
	Bus Type	PCI Express x16, 2.0 compliant
	Memory	Size: 1GB DDR3 Clock: 891MHz Memory Bandwidth: 29GB/s
	Connectors	One dual-link DVI-I connector One DisplayPort connector
	Maximum Resolution	VGA (via adapter cable): • 2048 × 1536 × 32 bpp at 85 Hz

Technical Specifications - Graphics

		Dual-link DVI • 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking) Single-link DVI • 920 × 1200 × 32 bpp at 60 Hz (reduced blanking) DisplayPort 1.2 • 3840 × 2160 × 30 bpp at 60 Hz
	RAMDAC	400 MHz integrated RAMDAC
	Display Output	Maximum number of displays supported: 2
	Shading Architecture	Shader Model 5.0
	Supported Graphics APIs	DX11, OpenGL 4.4 Programming support for CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Python, and Fortran
	Available Graphics Drivers	Microsoft Windows 8.1 Microsoft Windows 8 Microsoft Windows 7 Linux
	Notes	1. Factory configured Quadro K420 does not include any video adapters. Adapters must be ordered separately. 2. Option kit Quadro K420 includes one DP to DVI-D adapter.
NVIDIA Quadro K2200 4 GB Graphics	**Form Factor**	4.38" H x 7.97" L Single Slot, Full Height
	Weight:	240 grams
	Graphics Controller	NVIDIA Quadro K2200 Graphics Card GM107 GPU 640 CUDA cores Max Power: 67.7 Watts
	Bus Type	PCI Express 2.0 x16
	Memory	4 GB GDDR5, 2500 Mhz 128-bit memory I/O path 80 GB/s memory bandwidth
	Connectors	1 DL-DVI(I) output, 2 DisplayPort outputs Factory Configured Option: No video cable adapter included Option Kit: One DP-to-DVI adapter included with card Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories
	Maximum Resolution	DisplayPort: - up to 4096 x 2160 x 30 bpp @ 60Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST) DL-DVI(I) output: - up to 2560 x 1600 x 32 bpp @ 60Hz
	Image Quality Features	10-bit internal display processing pipeline 10-bit scan-out support
	Display Output	VGA: • requires use of DVI-to-VGA and/or DP-to-VGA video cable adapters

		• 400 MHz integrated RAMDAC • Max resolution: 2048 x 1536 x 32 bpp @ 85 Hz DL-DVI(I): • Max resolution: 2560 x 1600 x 32 bpp @ 60 Hz SL-DVI(I): • Max resolution: 1920 x 1200 x 32 bpp @ 60 Hz DisplayPort: • Supports HBR2 and MST • Max resolution: 4096 x 2160 x 30 bpp @ 60 Hz (only one monitor can be connected to a Quadro K2200 DisplayPort connector at this resolution) • Max number of DisplayPort daisy-chained monitors or hub connected monitors from a single Quadro K2200 DisplayPort connector: 4 with maximum resolution of 1920 x 1200 Maximum number of monitors across all available Quadro K2200 outputs is 4.
	Shading Architecture	Full Microsoft DirectX 11.1 Shader Model 5.0
	Supported Graphics APIs	OpenGL 4.4 DirectX 11.1 API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran
	Available Graphics Drivers	Microsoft Windows 8.1 Microsoft Windows 8 Microsoft Windows 7 Linux HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html
	Notes	1. Quadro K2200 offered as Factory Configured Option does not include a video cable adapter. Video cable adapters must be ordered separately. 2. Quadro K2200 offered as an Option Kit includes one DP-to-DVI video cable adapter. Additional cables must be ordered separately. 3. A total maximum of 4 active monitors are supported across all display output types. This may be accomplished by using daisy chained DisplayPort 1.2 displays or a DisplayPort 1.2 hub device. 4. A DisplayPort hub device may be used to connect multiple DisplayPort monitors to a single Quadro K2200 DisplayPort output.
AMD FirePro W2100 2GB Graphics	**Form Factor**	Low Profile, half length (full-height bracket included)
	Graphics Controller	AMD FirePro™ W2100 professional graphics Power: <50W Cooling: Active

Technical Specifications - Graphics

Bus Type	PCI Express® x8, Generation 3.0
Memory	2GB DDR3 memory Memory Bandwidth: 14.4 GB/s
Connectors	2x Display Port 1.2 connectors Factory Configured: No video cable adapter included Option Kit: One DP-to-DVI adapter included with card Additional DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as Factory Configuration or Option Kit accessories.
Maximum Resolution	DisplayPort 1.2: • up to 4096x2160 x 30 bpp @ 60Hz Dual Link DVI(I) (requires adapter cable): • up to 2560 x 1600 x 32 bpp @ 60Hz Single Link-DVI(I)(requires adapter): • up to 1920 x 1200 x 32 bpp @ 60Hz VGA(requires adapter): • up to 1920 x 1200 x 32 bpp @ 60Hz
Display Output	2 x DisplayPort® 1.2
Shading Architecture	Shader Model 5.0
Supported Graphics APIs	OpenCL™ 1.2, DirectX® 11 and OpenGL 4.4
Available Graphics Drivers	Windows 8.1 (64-bit and 32-bit) Windows 7 (64-bit and 32-bit) Red Hat Enterprise Linux (RHEL) SUSE Linux Enterprise Desktop 11(64-bit and 32-bit) Ubuntu HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html
Notes	Depending on the card model, native DisplayPort™ connectors and/or certified DisplayPort™ active or passive adapters to convert your monitor's native input to your card's DisplayPort™ or Mini-DisplayPort™ connector(s) may be required. See www.amd.com/firepro for details

Technical Specifications - Graphics

NVIDIA Quadro K4200 4GB Graphics	**Form Factor**	4.376" H x 9.5" L Single Slot, Full Height
	Weight:	~458 grams (without extender)
	Graphics Controller	NVIDIA Quadro K4200 Graphics Card Kepler GK104 GPU 1344 CUDA cores Max Power: 108 Watts
	Bus Type	PCI Express 2.0 x16
	Memory	4 GB GDDR5, 2700 MHz 256-bit memory I/O path 173 GB/s memory bandwidth
	Connectors	1 DL-DVI(I) output, 2 DisplayPort outputs CTO: No video cable adapter included AMO: One DP-to-DVI adapter included with card Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories
	Maximum Resolution	DisplayPort: - up to 3840 x 2160 x 30 bpp @ 60Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST) DL-DVI(I) output: - up to 2560 x 1600 x 32 bpp @ 60Hz
	Image Quality Features	10-bit internal display processing pipeline 10-bit scan-out support
	Display Output	VGA: • requires use of DVI-to-VGA and/or DP-to-VGA video cable adapters • 400 MHz integrated RAMDAC • Max resolution: 2048 x 1536 x 32 bpp @ 85 Hz DL-DVI(I): • Max resolution: 2560 x 1600 x 32 bpp @ 60 Hz SL-DVI(I): • Max resolution: 1920 x 1200 x 32 bpp @ 60 Hz

DisplayPort:

- Supports HBR2 and MST
- Max resolution: 3840 x 2160 x 30 bpp @ 60 Hz (only one monitor can be connected to a Quadro K4200 DisplayPort connector at this resolution)
- Max number of DisplayPort daisy-chained monitors or hub connected monitors from a single Quadro K4200 DisplayPort connector: 4 with maximum resolution of 1920 x 1200

HDMI:

- Requires use of DP-to-HDMI cable
- Max Resolution: 1920 x 1080 x 32 bpp @ 60Hz

Maximum number of monitors across all available Quadro K4200 outputs is 4.

Shading Architecture

Full Microsoft DirectX 11 Shader Model 5.0

Supported Graphics APIs

OpenGL 4.4

DirectX 11.1

API support includes:

CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran

Available Graphics Drivers

Microsoft Windows 8.1

Microsoft Windows 8

Microsoft Windows 7

Linux

HP qualified drivers may be preloaded or available from the HP support Web site:

http://welcome.hp.com/country/us/en/support.html

Notes

1. Quadro K4200 offered as CTO does not include a video cable adapter. Video cable adapters must be ordered separately.
2. Quadro K4200 offered as AMO includes one DP-to-DVI video cable adapter. Additional cables must be ordered separately.
3. A total maximum of 4 active monitors are supported across all display output types. This may be accomplished by using daisy chained DisplayPort 1.2 displays or a DisplayPort 1.2 hub device.
4. A DisplayPort hub device may be used to connect multiple DisplayPort monitors to a single Quadro K4200 DisplayPort output.

Technical Specifications - Graphics

NVIDIA Quadro K5200 8GB Graphics	**Form Factor**	4.376” H x 10.5” L Dual Slot
	Weight:	**~880 grams**
	Graphics Controller	NVIDIA Quadro K5200 GK 110 GPU 2304 CUDA cores Max Power: 150 Watts
	Bus Type	PCI Express 3.0 x16
	Memory	8GB GDDR5 256-bit memory I/O path 192 GB/s memory bandwidth
	Connectors	DVI-I (1), DVI-D (1), DP (2), Factory configured option: No adapter included with card. Option Kit: No adaptor included with card. DVI to VGA, DisplayPort to VGA, DisplayPort to DVI, and DisplayPort to Dual-Link DVI adapters available as accessories.
	Image Quality Features	• DisplayPort with Multi-Stream Technology (MST) and High Bit Rate 2 (HBR2), HDMI 1.4, and HDCP support • NVIDIA 3D Vision™ technology
	Display Output	400 MHz integrated RAMDAC • Maximum resolution over VGA (through DVI to VGA cable): 2048 × 1536 × 32 bpp at 85 Hz Dual-link internal TMDS (DVI 1.0) • Maximum resolution over digital port (single GPU and SLI mode): 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking) Single-link internal TMDS (DVI 1.0) • Maximum resolution over digital port (single GPU and SLI mode):1920 × 1200 × 32 bpp at 60 Hz (reduced blanking) DisplayPort with MST and HBR2.

- Maximum resolution: 4096 × 2160 × 30 bpp at 60Hz
- Maximum resolution:2560 x 1600 x 30bpp at 120Hz

HDMI

- Maximum resolution: 1920 × 1080 × 32 bpp at 60Hz

	Shading Architecture	Shader Model 5.0
	Supported Graphics APIs	OpenGL 4.4 DirectX 11 API support for NVIDIA's CUDA ™ C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran
	Available Graphics Drivers	Windows 8 Windows 7 Professional (64-bit and 32-bit) Red Hat Enterprise Linux (RHEL) 6 Desktop/Workstation (64-bit) SUSE Linux Enterprise Desktop 11 SP3(64-bit and 32-bit) HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html
	Notes	1. NVIDIA GRID VGX Pass Through feature supported on NVIDIA Quadro K5200 to enable direct mapping of GPU to Virtual Machine. 2. No display output adapter included.
NVIDIA Quadro K6000 12GB Graphics	**Form Factor**	4.376" H x 10.5" L Dual Slot Power: 234 Watts
	Weight:	~880 grams
	Graphics Controller	NVIDIA Quadro K6000 Graphics Card based on the GK180 GPU Core Count: 2880 Base Clock: 797 MHz Boost Clock: 902 MHz
	Bus Type	PCI Express 3.0 x16
	Memory	12GB GDDR5

Technical Specifications - Graphics

	384-bit memory I/O path 288 GB/s memory bandwidth ECC Memory
Connectors	DVI-I (1), DVI-D (1), DP (2), Optional 3D Stereo bracket with 3-pin mini-DIN connector. Factory configured option: No adapter included with card. Option Kit: No adaptor included with card. DVI to VGA, DisplayPort to VGA, DisplayPort to DVI, and DisplayPort to Dual-Link DVI adapters available as accessories.
Image Quality Features	• DisplayPort with Multi-Stream Technology (MST) and High Bit Rate 2 (HBR2), HDMI 1.4, and HDCP support • NVIDIA 3D Vision™ technology • NVIDIA Premium Mosaic and nView
Display Output	400 MHz integrated RAMDAC Maximum resolution over VGA (through DVI to VGA cable): 2048 × 1536 × 32 bpp at 85 Hz Dual-link internal TMDS (DVI 1.0) • Maximum resolution over digital port (single GPU and SLI mode): 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking) Single-link internal TMDS (DVI 1.0) • Maximum resolution over digital port (single GPU and SLI mode):1920 × 1200 × 32 bpp at 60 Hz (reduced blanking) DisplayPort with MST and HBR2. • Maximum resolution: 3840 × 2160 × 36 bpp at 60Hz HDMI • Maximum resolution: 1920 × 1080 × 32 bpp at 60Hz
Shading Architecture	Shader Model 5.0 Full IEEE 764-2008 32-bit and 64-bit precision
Supported Graphics APIs	Full OpenGL 4.3 Full DirectX 11

		CUDA API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran
	Available Graphics Drivers	Windows 8 Windows 7 Professional (64-bit and 32-bit) Red Hat Enterprise Linux (RHEL) 6 Desktop/Workstation SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit) HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html Novell SUSE Linux Enterprise drivers may also be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
	Notes	1. NVIDIA GRID VGX Pass Through feature supported on NVIDIA Quadro K6000 to enable direct mapping of GPU to Virtual Machine. 2. No display output adapter included.

HIGH PERFORMANCE GPU COMPUTING

NVIDIA Tesla K40 Workstation Compute Processor	**Form Factor**	Size: 4.376 inches by 10.5 inches Slots: Dual Slot Power Connectors: One 6-pin and one 8-pin
	Weight:	~826 grams
	System Interface	PCI Express Gen3 ×16
	Video Outputs	None.
	Memory	12GB GDDR5, memory path: 384-bit memory clock: 3Ghz
	Peak Memory Bandwidth	288 GB/s
	Supported APIs	CUDA, OpenACC, OpenCL 1.2 API support includes: C, C++, Java, Python, and Fortran
	Supported Operating Systems	Windows 8 (64-bit) Genuine Windows 7 Professional (64-bit) Red Hat Enterprise Linux (RHEL) 5, 6 Desktop/Workstation (64-bit) SUSE Linux Enterprise Desktop 11 (64-bit) HP qualified drivers may be preloaded or available from the HP support Web site:

Technical Specifications - Graphics

	http://welcome.hp.com/country/us/en/support.html Novell SUSE Linux Enterprise drivers may also be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
Processor Cores	GK110B GPU Base Clock: 745 MHz Boost Clock: up to 875 MHz 2888 CUDA cores
Power Consumption	~235 Watts
	Note: A 700W PSU is required for any K40 configuration on the Z440.

Technical Specifications – Optical and Removable Storage

OPTICAL AND REMOVABLE STORAGE

HP 9.5mm Slim SuperMulti DVD Writer	**Description**	9.5mm height, tray-load	
	Mounting Orientation	Either horizontal or vertical	
	Interface Type	SATA/ATAPI	
	Dimensions (WxHxD)	128 x 9.5 x 127mm	
	Supported Media Types	DVD-RAM DVD+R DVD+RW DVD+R DL DVD-R DL DVD-R DVD-RW CD-R CD-RW	
	Disc Capacity	DVD-ROM	8.5 GB DL or 4.7 GB standard
		Full Stroke DVD	< 200 ms (seek)
		Full Stroke CD	< 200 ms (seek)
	Maximum Data Transfer Rates	CD ROM Read	CD-ROM, CD-R Up to 24X CD-RW Up to 24X
		DVD ROM Read	DVD-RAM Up to 8X DVD+RW Up to 8X DVD-RW Up to 8X DVD+R DL Up to 8X DVD-R DL Up to 8X DVD-ROM Up to 8X DVD-ROM DL Up to 8X DVD+R Up to 8X DVD-R Up to 8X
	Power	Source	SATA DC power receptacle
		DC Power Requirements	5 VDC ± 5%-100 mV ripple p-p
		DC Current	5 VDC -< 800 mA typical, <1600 mA maximum
	Operating Environmental (all conditions non-condensing)	Temperature	41° to 122° F (5° to 50° C)
		Relative Humidity	10% to 80%
		Maximum Wet Bulb Temperature	84° F (29° C)
	Operating Systems Supported	Windows 8.1, Windows 8 32-bit and 64-bit, Windows 7 Professional 32-bit and 64-bit, Windows Vista Business 64*, Windows Vista Business 32*, Windows Vista Home Basic 32*, Windows 2000, Windows XP Professional or Windows XP Home 32*. Red Hat Enterprise Linux(RHEL) WS4**, 5, 6 Desktop/Workstation SUSE Linux Enterprise Desktop 10 & 11 No driver is required for this device. Native support is provided by the operating system.	

	Kit Contents	9.5mm Slim SuperMulti DVD Writer, 5.25" ODD Bay adapter/carrier, slim SATA data/power cable, installation guide	
HP 9.5mm Slim DVD-ROM Drive	**Description**	9.5mm height, tray-load	
	Mounting Orientation	Either horizontal or vertical	
	Interface Type	SATA / ATAPI	
	Dimensions (WxHxD)	128 x 9.5 x 127mm	
	Disc Capacity	DVD-ROM	Single layer: Up to 4.7 GB Double layer: Up to 8.5 GB
	Access Times	DVD-ROM Single Layer	< 110 ms (typical)
		CD-ROM Mode 1	< 110 ms (typical)
		Full Stroke DVD	< 230 ms (typical)
		Full Stroke CD	< 220 ms (typical)
	Power	Source	SATA DC power receptacle
		DC Power Requirements	5 VDC ± 5%-100 mV ripple p-p
		DC Current	5 VDC – <800mA typical, < 1600 mA maximum
	Operating Environmental (all conditions non-condensing)	Temperature	41° to 122° F (5° to 50° C)
		Relative Humidity	10% to 80%
		Maximum Wet Bulb Temperature	84° F (29° C)
	Operating Systems Supported	Windows 8.1, Windows 8 32-bit and 64-bit, Windows 7 Professional 32-bit and 64-bit, Windows Vista Business 64*, Windows Vista Business 32*, Windows Vista Home Basic 32*, Windows 2000, Windows XP Professional or Windows XP Home 32*. Red Hat Enterprise Linux(RHEL) WS4**, 5, 6 Desktop/Workstation SUSE Linux Enterprise Desktop 10 & 11 No driver is required for this device. Native support is provided by the operating system.	
	Kit Contents	9.5mm Slim DVD-ROM Drive, 5.25" ODD Bay adapter/carrier, slim SATA data/power cable, installation guide	
HP 9.5mm Slim BDXL Blu-Ray Writer	**Description**	9.5mm height, tray-load	
	Mounting Orientation	Either horizontal or vertical	
	Interface Type	SATA/ATAPI	
	Dimensions (WxHxD)	128 x 9.5 x 127mm	
	Supported Media Types	BD-ROM BD-R BD-RE DVD-RAM DVD+R DVD+RW DVD+R DL DVD-R DL	

Technical Specifications – Optical and Removable Storage

	DVD-R DVD-RW CD-R CD-RW	
Disc Capacity	DVD-ROM	8.5 GB DL or 4.7 GB standard
	Blu-ray	25 GB (single-layer) 50 GB (dual-layer) 100/128 GB (BDXL)
	Full Stroke DVD	< 230 ms (seek)
	Full Stroke CD	< 220 ms (seek)
	Blu-ray	< 230 ms (seek) (Full Stroke Blu-ray)
	Startup Time	(Time to drive ready from tray loading) BD-ROM (SL/DL) 25S / 28S BD-R (SL/DL) 25S / 28S BD-RE (SL/DL) 25S / 28S DVD-ROM (SL/DL) 18S / 18S DVD-R (SL/DL) 25S / 25S DVD-RW 25S DVD+R (SL/DL) 25S / 25S DVD+RW 25S DVD-RAM 45S CD-ROM 15S
Maximum Data Transfer Rates	CD ROM Read	CD-ROM, CD-R Up to 24X CD-RW Up to 24X
	DVD ROM Read	DVD-RAM Up to 8X DVD+RW Up to 8X DVD-RW Up to 8X DVD+R DL Up to 8X DVD-R DL Up to 8X DVD-ROM Up to 8X DVD-ROM DL Up to 8X DVD+R Up to 8X DVD-R Up to 8X
	Blu-ray	BD-ROM Up to 6X BD-ROM DL Up to 6X BD-R Up to 6X BD-R DL Up to 6X BD-R Up to 6X BD-RE SL/DL Up to 6X
Power	Source	SATA DC power receptacle
	DC Power Requirements	5 VDC ± 5%-100 mV ripple p-p
	DC Current	5 VDC -900 mA typical, 2000mA maximum
Operating Environmental (all conditions non-condensing)	Temperature	41° to 122° F (5° to 50° C)
	Relative Humidity	10% to 80%
	Maximum Wet Bulb Temperature	84° F (29° C)
Operating Systems	Windows 8.1, Windows 8 32-bit and 64-bit, Windows 7 Professional 32-bit	

Technical Specifications – Optical and Removable Storage

	Supported	and 64-bit, Windows Vista Business 64*, Windows Vista Business 32*, Windows Vista Home Basic 32*, Windows 2000, Windows XP Professional or Windows XP Home 32*. Red Hat Enterprise Linux(RHEL) WS4**, 5, 6 Desktop/Workstation SUSE Linux Enterprise Desktop 10 & 11 No driver is required for this device. Native support is provided by the operating system.
	Kit Contents	9.5mm Slim BDXL Blu-Ray Writer, 5.25" ODD Bay adapter/carrier, slim SATA data/power cable, installation guide As Blu-ray is a new format containing new technologies, certain disc, digital connection, compatibility and/or performance issues may arise, and do not constitute defects in the product. Flawless playback on all systems is not guaranteed. In order for some Blu-ray titles to play, they may require a DVI or HDMI digital connection and your display may require HDCP support. HD-DVD movies cannot be played on this workstation.
HP DX115 Removable Drive Enclosure	**Interface Type**	Compatible with SAS or SATA controllers. Offers 6Gb/s performance when used with 6Gb/s HDDs.
	Dimensions (WxHxD)	147.6mm W x 41.1mm H x 205mm D (5.81” W x 1.62” H x 8.08” D)
	Approvals	Frame and Carrier: 1.73 kg (3.8 lbs.) Carrier: 0.45 kg (1 lbs.)
HP 15-in-1 Media Card Reader	**Description**	Supports hardware ECC (Error Correction Code) function Supports hardware CRC (Cyclic Redundancy Check) function Supports MS 4-bit parallel transfer mode Supports MS-PRO 4-bit parallel transfer mode Supports MS PRO-HG Duo 4-bit parallel transfer mode Supports SD 4-bit parallel transfer mode Supports UHS-104 SD 4-bit card (version 3.0) Supports CF v6.0 with PIO mode 6 and Ultra DMA 7 mode
	Interface Type	USB 3.0 High-speed interface **Note:** If there is a USB2 connection, USB2 transfer speeds are supported.
	Dimensions (WxHxD)	4.9 x 4 x 1 in (124.5 x 101.6 x 25.4 mm) Fits conveniently in the 5.25" drive bay.
	Supported Media Types	CompactFlash Type I CompactFlash Type II Microdrive Secure Digital Card (SD) Secure Digital High Capacity (SDHC) SD Extended Capacity Memory Card (SDXC) SD Ultra High Speed II(SD UHSII) Memory Stick Memory Stick Select Memory Stick Duo (MS Duo) Memory Stick PRO (MS PRO) Memory Stick PRO Duo (MS PRO Duo) Memory Stick PRO-HG Duo MagicGate Memory Stick (MG)

Technical Specifications – Optical and Removable Storage

	MagicGate Memory Stick Duo These additional media types are supported with a card adapter. Memory Stick Micro (M2) miniSD miniSD High Capacity Micro SD Memory Card (MicroSD) Micro SD High Capacity Memory Card (MicroSDHC) Test Parameters/Conditions - Power applied, unit operating on system ±5%
Operating Systems Supported	Windows 8 Pro (64-bit)* Windows 8.1 (64-bit)* Windows 8 (64-bit)* Windows 7 Ultimate (32-bit)** Windows 7 Ultimate (64-bit)** Windows 7 Professional (32-bit)** Windows 7 Professional (64-bit)** Windows 7 Home Basic** Windows 7 Home Premium (32-bit)** Windows 7 Home Premium (64-bit)** Windows Vista Business 64 Windows Vista Business 32 Windows Vista Home Basic 32 Windows XP Professional Windows XP Home 32 No driver is required for this device. Native support is provided by the operating system. Not all features are available in all editions of Windows 8. Systems may require upgraded and/or separately purchased hardware, drivers and/or software to take full advantage of Windows 8 functionality. See http://www.microsoft.com. Not all features are available in all editions of Windows 7. This system may require upgraded and/or separately purchased hardware to take full advantage of Windows 7 functionality. Seehttp://www.microsoft.com/windows/windows-7/ for details.
Kit Contents	Media card reader, 5.25" bracket/rails/bezel, Install Guide, IO & Security Software and Documentation CD
Approvals	USB-IF, WHQL, Compliant with USB Mass Storage Class Bulk only Transport Specification Rev. 1.0, Compliant Intel Front Panel I/O Connectivity Design Guide V. 1.3, FCC, CE, BSMI, C-Tick, VCCI, MIC, cUL, TUVT
Weight	0.35 lbs. (0.16 kg)

CONTROLLER CARDS

HP IEEE 1394b FireWire PCIe Card	**Data Transfer Rate**	Supports up to 800 Mb/s
	Devices Supported	IEEE-1394 compliant devices
	Bus Type	PCIe card full height PCIe slots
	Ports	Two IEEE-1394b external 9-Pin connectors (Rear)
	Internal Connectors	One 10-Pin header connector
	System Requirements	Windows 8.1 64-bit, Windows 7 Professional 32-bit and 64-bit, SLED 11 and RHEL 6. Intel i5 series or higher processor, min 2GB of RAM, 20GB Hard Drive, CD-ROM drive, built in sound system, Available PCIe slot.
	Temperature - Operating	50° to 131° F (10° to 55° C)
	Temperature - Storage	-22° to 140° F (-30° to 60° C)
	Relative Humidity - Operating	20% to 80%
	Compliances	FCC Part 15B, cULus 60950, CE Mark EN55022B(1995)/EN55024-1998 STD, Taiwan BSMI CNS13438, Korea MIC
	Operating Systems Supported	Windows 8.1 64-bit, Windows 7 Professional 32-bit and 64-bit
HP Thunderbolt-2 PCIe 1-port I/O Card	**Data Transfer Rate**	Supports up to 20 Gb/s (20,000 Mb/s)
	Devices Supported	Thunderbolt™ certified devices
	Bus Type	PCIe card, full or half height PCIe slots
	Ports	One Thunderbolt™ 2 external 20-Pin output connectors (Rear) One full size DisplayPort input connector (Rear)
	Internal Connectors	One 5-Pin header connector
	System Requirements	Genuine Windows 7 Professional 64-bit, Genuine Windows 8.1 64-bit, Intel i5 series or higher processor, 4-GB RAM, 20-GB Hard Drive, available PCIe slot.
	Temperature - Operating	50° to 131° F (10° to 55° C)
	Temperature - Storage	-22° to 140° F (-30° to 60° C)
	Relative Humidity - Operating	20% to 80%
	Compliances	FCC Part 15B, cULus 60950, CE Mark EN55022B(1995)/EN55024-1998 STD, Taiwan BSMI CNS13438, Korea MIC
	Operating Systems Supported	Genuine Windows 7 Professional 64-bit, Genuine Windows 8.1 64-bit.
	Kit Contents	HP Thunderbolt™ 2 PCIe 1-port I/O Card, full height and half height bracket, DisplayPort to DisplayPort cable, internal header cables (2), user documentation and warranty card.

NETWORKING AND COMMUNICATIONS

Integrated Intel I218LM PCIe GbE Controller	**Connector**	RJ-45 (motherboard integration)
	Controller	Intel I218LM GbE platform LAN connect networking controller
	Memory	3 KB FIFO packet buffer memory (both Tx and Rx)
	Data Rates Supported	10/100/1000 Mbps
	Compliance	802.1as, 802.1p, 802.1Q, 802.3, 802.3ab, 802.3az, 802.3i, 802.3u, 802.3x, 802.3z
	Bus Architecture	PCI Express 1.1 (x1) and SMBus
	Data Transfer Mode	PCIe-based interface for active state operation (S0 state) and SMBus for host and management traffic (Sx low power state)
	Power Requirement	Requires 3.3V only (integrated regulators)
	Boot ROM Support	Yes
	Network Transfer Mode	Full-duplex; Half-duplex (not supported for the 1000BASE-T transceiver)
	Network Transfer Rate	10BASE-T (half-duplex) 10 Mbps 10BASE-T (full-duplex) 20 Mbps 100BASE-TX (half-duplex) 100 Mbps 100BASE-TX (full-duplex) 200 Mbps 1000BASE-T (full-duplex) 2000 Mbps
	Management Capabilities	WOL, auto MDI crossover, PXE, Muti-port teaming, RSS, Advanced cable diagnostics AMT 9.1 support, vPro compliant
HP X520 10GbE Dual Port Adapter	**Hardware Certifications**	FCC B, UL, CE, VCCI, BSMI, CTICK, KCC
HP 10GbE SFP+ SR Transceiver	**Operating Temperature**	0°C to 45°C (32°F to 113°F)
	Operating Humidity	0% to 85%, noncondensing
	Dimensions (H x W x D)	0.47(h) x 0.54(w) x 2.19(d)inches (1.19 x 1.38 x 5.57 cm)
HP 361T PCIe Dual Port Gigabit NIC	**Connector**	Two RJ-45
	Controller	Intel® Ethernet I350 Controller
	Data Rates Supported	10/100/1000 Mbps, Half- and full-duplex
	Compliance	802.3, 802.3u, 802.3x, 802.3ab, 802.3ad, 802.1p, 802.1Q, 802.3az, IEEE 1588 PCIe v2.0 standard RoHS (6 of 6) FCC (U.S. only) Class B DOC (Canada) Class B CE EN 55024, EN55022 Class B VCCI Class II UL 1950 CSA 950 EN 60950 CE ACPI 1.1a Microsoft WHQL (Windows Hardware Quality Labs)
	Data Path Width	Four lane (x4) PCI Express compatible with x4, x8, and x16 PCI Express slots

Technical Specifications - Networking and Communications

	Power Requirement	4.1W idle without EEE link partner 3.2W idle with EEE link partner 4.2W maximum
	Network Transfer Rate	10BASE-T (half-duplex) 10 Mb/s 10BASE-T (full-duplex) 20 Mb/s 100BASE-TX (half-duplex) 100 Mb/s 100BASE-TX (full-duplex) 200 Mb/s 1000BASE-T (full-duplex) 2000 Mb/s
	Operating Temperature	32° to 131°F (0° to 55° C)
	Operating Humidity	10% to 95% non-condensing
	Dimensions (H x W x D)	5.3 x 2.5 in (13.50 cm x 6.4 cm) (without brackets)
	Operating System Driver Support	Windows 7 Professional 32-bit and 64-bit. Red Hat Enterprise Linux(RHEL) WS4, 5, 6 Desktop/Workstation Novell SLED 10 & SLED 11
	Kit Contents	HP 361T PCIe Dual Port Gigabit NIC PCA with a standard height bracket attached to it (the low profile bracket is included in the clamshell that the PCA ships in) Product Warranty statement and the Quick Install Card (QIC).
Intel 7260 802.11 a/b/g/n PCIe WLAN NIC	**Operating Humidity**	Operating 10% to 90% (non-condensing) Non-operating 5% to 95% (non-condensing)
	Dimensions (H x W x D)	Native HMC: 26.8 x 30.0 x 2.4 mm Carrier Card Assembly 3.3 x 4.7 in (84 x 119 mm)
	Kit Contents	PCIe x1 card with full height bracket, rf antenna, antenna cable, separate low profile bracket, software CD and warranty.
	Notes	1. WLAN supplier's client utility is required for Cisco Compatible Extensions support with Microsoft Windows XP. WLAN may also be compatible with certain third-party software supplicants. WLAN supplier IHV extensions required for Cisco Compatible Extensions support for Microsoft Windows Vista. 2. Check latest software/driver release for updates on supported security features. 3. Maximum output power may vary by country according to local regulations. 4. In Power Save Polling mode and on battery power. 5. Receiver sensitivity is measured at a packet error rate of 8% for 802.11b (CCK modulation) and a packet error rate of 10% for 802.11a/g (OFDM modulation).

Summary of Changes

SUMMARY OF CHANGES

Date of change:	Version History:		Description of change:
August 21	V1	Added	Style and technical specifications
October 1, 2014	From v1 to v2	Added	Rack dimensions, note to supported components: memory, Foxit PhantomPDF Express and Cyberlink Power2Go: software, Optical drives: DVD, BD-XL specs
		Changed	Turbo specs for E5-1660v3, Acoustics - only 1 ODD on the high-end config, not 2, Declared Noise Emissions section, Supported Components: Graphics, Optical and Removable Storage, Overview, Stable & Consistent, power supply configurations, Noise Emissions section, Updated Power Supply Configurations and table
		Removed	Cyberlink MediaSuite, TPM 2.0 references, HP Power Assistant and PDF Complete
December 3, 2014	From v2 to v3	Added	HP Z440 Memory Cooling Solution, power cable descriptor in Overview and System Technical Specifications sections

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